



FRIDAY, OCT. 30.

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## Contributions.

## Electric Motors for Railroads.

CHICAGO, Oct. 26, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

We see a good many references in the daily press as to the millenium which is going to take place in railroad affairs upon the arrival of a practicable electric motor. Trains are to be run at fabulous speed, at very frequent intervals, and at greatly reduced expense as compared with present methods. Leaving out the matter of speed and frequency of trains, it may be interesting to examine, if possible, into the question as to what elements of saving in operating can be effected by the coming change.

In looking over the general list of railroad expenses as they now exist, it seems that in the various departments of administration, maintenance and repairs, there will be fully as many items of expense as at present, and most of them will not be materially changed. The cars, buildings and structures of all kinds will be as numerous and elaborate, to handle a certain amount of passenger and freight, as at present. The motors to be used, no matter what their form, will undoubtedly cost as much as the locomotive plant now in use, and as many men will be needed to operate them.

The more we look into the subject, the more it seems as if the sole advantage of the money side of the balance in the adoption of electrical methods, is a better development of power from the material in which it is stored, being, so far as we know now, the fuel consumed. There are intimations by enthusiasts of some occult forces which, in some mysterious way, are to give forth a much larger percentage of power than was used in forming them, but the history of the world, so far, gives no indications that the effect in mechanical matters has ever been more than the cause.

The bill for locomotive fuel on the average road may be safely assumed at 10 per cent. of the ordinary operating expense. This would represent in money on a road spending \$15,000,000 per year, \$1,500,000. We know, however, that by the adoption of the compound engine where possible, and by the most approved boiler construction, water purification and drill in firing, we can reduce this figure fully one-third, which would leave us with a yearly expenditure of fuel on our sample road, of \$1,000,000. This million dollars is probably all the margin we shall have to work on. It is not claimed by any one that the coming forms of motive power will utilize the entire mechanical force of the material employed to develop it, so that we cannot assume a possible saving of this whole \$1,000,000. If we concede, which is allowing the utmost that can possibly be claimed, that three-quarters of the fuel would be saved, the traffic being handled with one-quarter the amount we shall expect to use when present devices are utilized to their utmost practicable limit, we would have a saving of \$750,000 per year.

A railroad property showing earnings of say \$22,000,000 annually, and expenses of \$15,000,000, would represent for good western traffic, a mileage of 4,000. If worth \$35,000 per mile, which would be about the present value of a plant capable of doing the traffic indicated, we should have a total value to be covered by capitalization of \$140,000,000. Upon this amount the saving of \$750,000 annually would represent about one-half of one per cent. interest or dividend. This seems a very small amount as compared with the seeming expectations of some writers, but it is all that our present light upon the general subject seems to indicate.

AUDITOR.

## High Speed Locomotives.

PHILADELPHIA, Oct. 26, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to the letter of J. Bernard Walker in your issue of Oct. 16, to which you have called my attention, I would say:

Our friend, Mr. M. N. Forney, of the *Railroad Journal*, has very often used the expression that locomotives are made to pull trains, and as trains vary in size, locomotives vary as well. Is it not reasonable to suppose that after 60 years' experience the weight of the engines employed in American passenger and freight service must be correct, even though the designs may not be calculated to give the most economic results? I do not attach much importance to the comparison made by Mr. Walker—actual service eliminates many things that are otherwise difficult to understand. We have had no practical experience with Mr. Worsdell's engine, the repairs required to keep it on the rails, etc., but we do know from practical experience that the Reading engines are doing splendid work continuously and very economically, making speeds of 60 and 70 miles per hour—eight and ten car trains.

Mr. Walker is correct in saying that we must use high wheels and compound cylinders, but for American railroads to resort to single drivers, never! Large drivers can be more advantageously used with compound cylinders, although an increase in size of driving wheels of single expansion engines has given the very best results in both passenger and freight service, with grades of 42 feet per mile. On the Baltimore & Ohio, passenger engines with 19 in. x 24-in. cylinders and 66-in. driving wheels, have been run in comparison with engines having 20-in. x 24-in. cylinders and 78-in. driving wheels—the same in all other respects. Also on the New York, Lake Erie & Western, with grades of 60 ft. per mile—10-wheel freight engines having 62-in. driving wheels are hauling the same trains that the consolidation engines having 50-in. driving wheels are able to handle. In both cases the high driving wheel engines have proved their superiority.

The wear to the engines seems to be inversely as the square of the diameter of wheels, and the service rendered by high wheel engines on several roads indicates that the low driving wheel engines, freight and passenger, will soon be things of the past.

The repairs to road bed will also decrease with the advent of higher driving wheels. The damage done to the tracks will vary as the weight of counterbalance necessary to balance the reciprocating parts, and the revolutions per mile are reduced. Calculations made comparing the engines mentioned show that the high driving wheels in passenger service are 23 per cent. and in freight service 43 per cent. less destructive to the road bed and bridges than the low driving wheels.

I advocate higher driving wheels for all classes of service, higher weights per driving wheel, compound cylinders for all classes of service, and beg to add that the number of compound locomotives of the Vaucrain type under construction at the present time in our works, comprising, as it does, all classes, would lead one to believe that the American locomotive of the past cannot be the American locomotive of the future.

S. M. VAUCLAIN.

## Methods of the Demurrage Managers.

SCRANTON, Pa., Oct. 16, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It has been suggested that a little information as to how the managers of the different car service associations obtain the figures showing average daily detention to cars, as published in the quarterly statements made by the National Association of Car Service Managers, would possibly be of interest to your readers; and in view of a remark recently made by one railroad man, that presumably many of the variations in results are due to the peculiarities of the different local managers in making allowances for weather, large shippers, etc., I will venture a bit of testimony.

This, to the best of my knowledge and belief, is not the case. On the contrary, the local managers are nearly all members of the National Association, and it is the first and most distinct object of the National Association to secure uniformity in making allowances, and to secure an equal application of the rules, by all the roads, to the business of both big and little shippers. To that end, standing committees of reference, of uniform books and blanks and of uniform rules, method of computing detention and penalty to be exacted for excess detention are now at work. Reports are expected from these committees and progress will be made along these lines at the semi-annual meeting of the National Association to be held in New York city this month. Further than this, if the peculiarities of managers do govern them in allowances for weather and in allowances to big shippers, it would only directly affect the revenue and not the detention. All the local associations are required by resolution adopted by the National Association to follow a prescribed method for obtaining average detention figures, and it is not intended that any association's figures shall be published in the quarterly statement that are not arrived at in accordance with the prescribed method. The average daily deten-

tion per car as shown in the quarterly statements of the National Association is derived by dividing the total number of days all cars are detained, from arrival at station to release by consignee, deducting Sundays and legal holidays, by the total number of cars reported. Any departure from this rule is explained by foot note to the statement.

The most clearly marked differences in results obtained by different associations are those of the south compared with the central and northern associations. The increased detention of the southern associations, it seems fair to conclude, follows the same causes that suggested to these associations the need of rules allowing cars to stand under load longer than is allowed in the north. The rules of the Virginia and the New Orleans associations, for example, allow time for unloading many commodities additional to the 48-hour rule which obtains pretty uniformly on all commodities in all the northern associations.

It is a clearly observed fact that, unless individual circumstances require more prompt loading or unloading, the public is disposed to enjoy to the fullest whatever time privileges are allowed. Perhaps this may be another way of saying that the roads in the different associations have carefully estimated the average requirements of their patrons and have adopted rules in accordance therewith; but the point I would make is that where the rules of any association allow extended detentions on several different commodities the average detention obtained by that association is in about the same ratio of increase.

Where with any given association different average detention results are obtained during different quarters the revenue collected by that association will usually be found commensurate with the fluctuation of the detention.

A. G. THOMASON,  
Secretary of the National Association  
of Car Service Managers.

## Tunnel Ventilation.

CHICAGO, Oct. 26, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read carefully the proof of the editorial on ventilation which you have sent and offer some criticisms on it.

It has been the intention in the tunnel schemes to take the air in at the end of the train by means of funnels or otherwise, and to have an open passage throughout the train with vestibules between cars. The cars do not fill the tunnel within about six inches, on all sides; hence, there would be a rush of air along the roof and sides of the cars, which it was intended to collect, if necessary, by means of openings in the sides and roofs. In this way the air could be changed in the cars oftener and with greater velocity than the comfort of the passengers would permit. There is a vacuum, partial of course, behind the train, which would necessarily act to draw into the cars some portion of the air at the front of the train. Undoubtedly, the cars at the rear would not receive as much air from the tunnel as those would at the head of the train. With the train in motion there should be no difficulty in getting the air of the tunnel into the cars and out again; but with the cars standing still there would be a problem to be solved. Probably the only means of getting the tunnel air into the cars would be by using an electric fan in each car, such as is now used on the Chicago, Milwaukee & St. Paul trains. On those trains a small motor drives a 12-in. fan, which is mounted at one end, and which ventilates the car in a very satisfactory manner in hot weather with the windows open. I do not see why the tunnel air could not be forced to enter the cars in sufficient quantity.

But this is not all of ventilation; the tunnel will be musty and the air will, while possibly having sufficient oxygen (if not sufficient, at least as much as the traveling public is accustomed to), not be free from odor, which would suggest bad ventilation. I do not see how this can be remedied. The mold which gathers in subterranean places is supposed to give off a fine dust, which has a suffocating effect. If the tunnel itself can be ventilated by the movement of the train, the cars, I think, will be equally well ventilated.

The fan exhaust proposition is impracticable. In any case they would have to work harmoniously with the movement of the train in order to be reasonably efficient. If the trains could be relied upon to remove one-half the air in the tunnel, which would be displaced by the movement of the train if it acted as a plunger, the supply of oxygen for breathing purposes would probably be sufficient. The difficulty would be to prevent the air driven ahead of the train from following in the wake of a preceding train. It was intended to cover this point by having two air openings—one for the air exit at a station, the other for an air inlet, the tunnel being closed by a movable partition between the two openings. This would make what is, in effect, an air pump and would work well enough, perhaps, as far as the oxygen supply is concerned. The air pressure on the ends of the train would be sufficient to blow the tunnel air through the train, and in sufficient quantity to keep the air within the cars approximately with the same oxygen as the average in the tunnel. If the fans were worked intermittently to exhaust or blow into the tunnel, as desired, they might be of some use, but the expense of operation would be nearly prohibitive. A vast volume



of air with a minute and a half between stations would be forced out of the tunnel every minute. It would take an extremely large fan to do as much as a train can be made to do. Surely, by arranging proper movable partitions the trains could be made to pump in and out more air per minute than could be used by full train loads of passengers. I do not see that the writer of the editorial takes into account the possibility of using the piston effect of the train with a degree of intelligence, or rather economy, which would take advantage of the full value of such movement of train as pistons.

I remember the odors of the London tunnels. They are bad, and are made so largely by the amount of sulphur which escapes from the locomotives, but they are not half as disagreeable as the "hot odorous quality" of the Chicago suburban steam cars or street cars. Intelligent ventilation of the tunnel cars to the tunnel atmosphere would produce more agreeable results than the best ventilation of the Chicago city or suburban trains. The air might smell greasy or musty, but it could not be *solid*, and that is what we get here.

The above is all based on the subdivision of the tunnel into single track tunnels, with no connection between the down and up tunnels at any point.

The noise in a tunnel will always be greater, of course, but it can be reduced to be much less than it is in the Bergen Hill tunnel on the Erie. It was intended originally to have a superior rail joint and a soft asphaltum bed for the sleepers, and longitudinal stringers under the rails for the New York underground. A. B.

#### Locomotive Boiler Explosions.

HARTFORD, Conn., Oct. 20, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice by to-day's press dispatches that another Wootten boiler has gone the way of its kind—blown to bits in the air; and that three men's lives went out with it, while another man was fatally injured.

How many human lives will it be necessary to sacrifice before this very unreliable and dangerous form of construction is proven to be a failure as a locomotive boiler? We hear of explosions every few months on the Reading Railroad, and they are almost always attended with loss of life, while if inquiry is made as to the cause at any time, it is explained as low water, or remains a mystery.

Now, I do not believe that there is anything mysterious about boiler explosions; nor do I believe that there is any excuse whatsoever for explosions from low water. If a boiler is properly constructed it should not rupture from low water; while, as for mysterious explosions, I quote from the report of the board of experts, who made a long series of experiments several years ago for the Government, to determine the causes of boiler explosions. "A boiler explodes because it is not strong enough to carry the pressure put upon it. Its weakness may be original or induced."

If originally a boiler is designed to carry a given pressure, with a factor of safety of five or six, and its strains can be figured (which they cannot be, with any degree of certainty, on the Wootten form and system of radial screw stays, as no two rows of stays are of the same length on one side of the boiler, and are put through the sheets at an angle that does not permit of a full thread), there should be no excuse for rupturing at one-fifth of the pressure it is supposed to be capable of carrying without rupturing.

As to rupture from low water, there is no case on record where a corrugated cylinder firebox has ruptured under these conditions with low water; while many cases are on record where there has been low water and nothing more serious than a gradual collapse, without rupture, has occurred. This is a fact, which I can prove by Lloyd's inspectors of steam vessels, where thousands of boilers, carrying 100 lbs. pressure, are in use on long voyages, where they are under forced draught for as long as 30 days and nights without rest, and more than 30,000 of these furnaces have been in use now for from 10 to 12 years and have not ruptured, while locomotive boiler explosions are of almost weekly occurrence, with about a similar number of locomotives in use. A large percentage of these explosions occur on boilers with radial stays. Is there, then, any excuse for a boiler constructed on these unmechanical lines, which is self-destructive, even if it has no pressure to carry, being destroyed by its own contraction and expansion?

ENGINEER.

Of the hundred and odd engines of the Wootten type which have come under my observation during the past two years, I have not found a single staybolt broken, although I have found a number loose in the bend of the sheet where the connection sheet joins the cylindrical part of the boiler, but this is a defect which we find in nearly all locomotive boilers.

I have seen Wootten boilers in which the water had been half way down the flue sheet, and boilers under an unusual pressure, and the only result a slight bulging of the crownsheet and slight opening of seams. This is not an exception, but one out of five or six cases which have come under my notice. I have yet to observe a single case of explosion of a Wootten boiler.

Referring to the quotation of "Engineer," which I think is taken from Thurston [We believe Mr. Coleman Sellers should have the credit of the neat summing

up quoted by "Engineer."—EDITOR.] I would go somewhat further and say that boilers explode because they are not strong enough to carry an excessive pressure put upon them through careless or ignorant management; on account of original weakness in design or workmanship, and on account of lack of proper inspection and care. It is my opinion that the lack of proper care and inspection has more to do with boiler explosions than anything else.

I note that "Engineer" says "the stays are put through the sheets at an angle that does not permit of a full thread." This is the case with some of the stays, but I think did he examine the later types of Wootten boilers, he would find that the curved sheets of the furnace and shell are so arranged that many of the stays get a good hold on both sheets.

In my opinion the Wootten firebox as at present constructed is a stronger form than the ordinary firebox, where the wagon top of boiler is very large and the side sheets have to be given a comparatively short bend in order to bring them inside of the frames, the breaking strains on the stays at this bend being far greater than any of the Wootten boilers. This opinion is verified by our having to renew stays in this part of the boiler. The Woottens have required less repairs than any others I have had under my charge. MASTER MECHANIC.

[The boiler which exploded on the Reading, Oct. 19 was not a Wootten boiler. It was a narrow firebox boiler, with crown bars, and not radial stayed. The Master Mechanic who comments on "Engineer's" letter has peculiarly good opportunities to see the Wootten boiler; he is not on the Philadelphia & Reading, and, we believe, never has been.—EDITOR RAILROAD GAZETTE.]

#### Efficiency in Freight Train Service.

CHICAGO, Oct. 23, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read with interest Mr. Wattson's paper read at New York, last week, and was disappointed to see no report of any discussion of it. Mr. Wattson deserves credit for stating his opinions so frankly and clearly. I may find it difficult to be equally clear, but premising that I heartily agree with Mr. Wattson on many points, I wish to take issue with him on one or two topics, especially that with which I have headed this letter.

When railroading first began, when the business was small and there were only a few men employed upon any road, there grew up a kind of family-circle grouping of the employees, especially of the trainmen, which was delightful to them and not very objectionable otherwise, because the number of persons to be controlled was not so large but that the superintendent could become well acquainted with them all and with all their ways. Each engineer had his own engine, each passenger conductor his own train of cars, and each freight crew ran every day upon the same schedule, much as the stage drivers and canal boat crews had each operated their single special conveyances, which the trains replaced. Everyone will remember that those were days when a rather sleepy order of things prevailed, and that it required vigorous stirring up to secure efficiency when, after a while, a great increase of traffic came upon the roads, and it became important that all hands should be wide awake. Since then experience has shown that to secure the best service from the large forces now employed each railroad man should be trained as an integer, ready for duty in any group to which he may be assigned upon a moment's notice, according to exact rules which have been prepared with great care, as a sort of language of the profession, which each man shall understand, and exact obedience to which will secure an uniform and safe result.

Instead of grouping engine and train crews, it is better that they should be worked separately and independently—for it has been found that crews which run regularly together acquire or adopt undesirable habits in signalling, in loafing on the road, sometimes in drinking and in the concealment of each other's faults and mistakes.

No doubt there are some advantages of convenience in having the way freight crews, which distribute parcels along a division, run continuously upon the same train; but the tendency to fall into slipshod ways of doing work is so great that it may be doubted whether on the whole a frequent change of crews is not very desirable even there. To keep the train forces active, alert, subject to discipline, free from cabals, run them first in first out, without any exception; the business must then be promptly done, according to rule, and when it is not so done the superintendent will be likely to hear of it. When the way freight conductor runs regularly on the same train daily, back and forth on the division, if he puts off the wrong parcels at any station one day he can correct it the next and he becomes heedless. He is such a good fellow, and he never tells on the agents if they make mistakes, so they never tell on him. A little systematic watching of how many abuses have crept into his way freight service will convince any superintendent that he had better separate his men than to keep them together.

Mr. Wattson concedes that this system, first in first out, will secure the maximum engine performance and minimum fuel consumption; there is no doubt whatever

that it also secures the highest discipline and most vigilant attention to the minutest necessities of the service.

The recommendations in the paper as to making up of freight trains are wise, but it may be remarked that the trouble in blockaded yards is not generally caused by switching of trains, but by the mistake of allowing the yards to become so blocked that the necessary switching cannot be conveniently and rapidly done. A simple remedy for blockaded yards is to limit the number of cars that may be delivered into them at one time. Better to keep the trains out on a siding, or even on the main track, rather than impede the work of the yard engines. This is well known to experts, but is not apprehended by many persons of much experience, who have not previously had to struggle with yards that were overfull.

Mr. Wattson states next a problem for which he does not offer a solution—namely, how to provide freight crews for the busy season without overworking the regular force and without employing "floaters." This is a serious problem to any thoughtful superintendent; yet, if he is well acquainted with his men and with his neighborhood, he can generally expand his force immediately, and, quite safely to say, one-third greater number of crews, at least if his road has been running for some years. The head brakeman of each freight crew ought to have got experience enough to fit him for promotion to be a freight conductor; his place can be supplied by the promotion of the second brakeman, and putting a new man into the second place. Along every division of any old railroad there are numerous experienced men, engineers, conductors and brakemen retired to farms, shops, etc., who are glad to resume their old work for a time, especially in winter; so that only a few floaters should be needed for the new crews headed by the old brakemen. Without doubt there is some risk, yet if we remember that whenever there is an accident due to heedlessness, the Division Superintendent almost always says in extenuation, that the erring brother was the best and one of the oldest of the men on the division, whom he never would have thought capable of such a neglect, we must recognize the fact that fresh men are more alert than those who have become too much used to their work. At any rate, some such method as this is safer than overworking the men so unjustifiably as has been practiced on many roads.

ARCHIMEDES STEPHENSON WATT, C.E.

#### The Hanrahan Refrigerator Car.

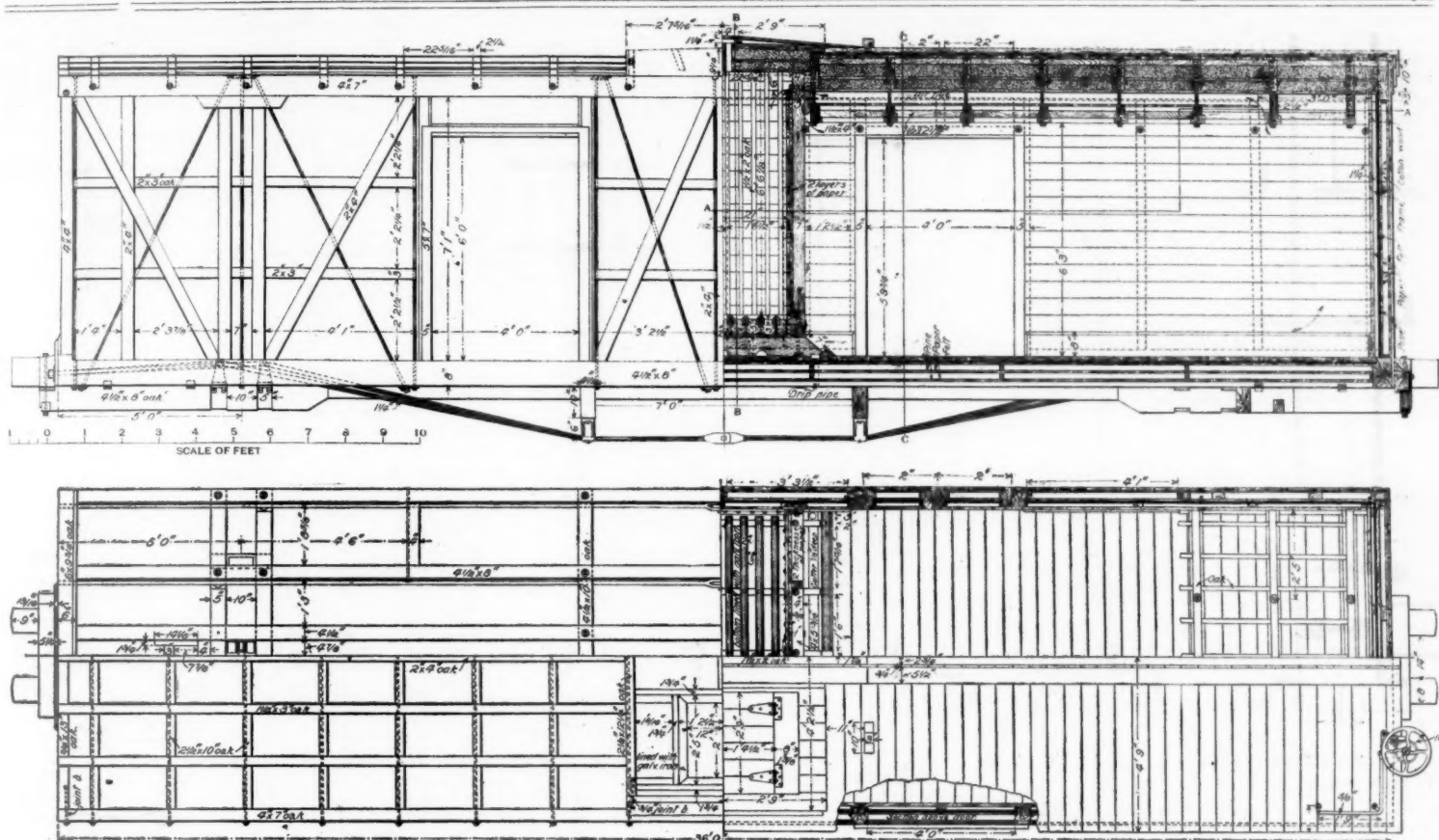
This car is designed on the assumption that for the proper preservation of perishable products the air should not only be changed but purified, and, therefore, there should be a continuous circulation. If circulation is not good, condensation must take place, inducing decay. A perfect car should carry fruits as well as meats, and no perishable foods should be carried in a low temperature, as they must eventually be exposed to warmer air, causing condensation on the surface of the cold material. The Hanrahan system illustrated is based on the premises that cold air descends, hot air ascends; that the hottest part of the ascending air receives and carries off the odors, and the cold air in its descent through an ice chamber is purified of its odors by contact with the moisture from the melting ice; and finally, it is assumed that no two cold bodies of air should come in contact; neither should a cold and hot volume of air collide.

It will be seen that the ice chamber is placed in the middle of the car, refrigeration being of first importance, causing two doors to be placed in each side of the car, which is considered an advantage for several reasons, the car being braced in the middle where its sides are ordinarily cut away and the two doors giving better facilities for loading and unloading. There are no metal tanks, merely a pan on the floor of the ice chamber. On this is a set of joists, and on these joists a second floor, opened in the centre. On this floor is a second series of joists directly over the first, and on these cross pieces, as shown, thus making a rack in two sections that can be taken out of the ice chamber in a few minutes by removing eight bolts. The ice rests on this rack so that the weight of ice is on the floor and not on the walls. The ducts are so arranged that either one-half or the whole of the car can be refrigerated as required.

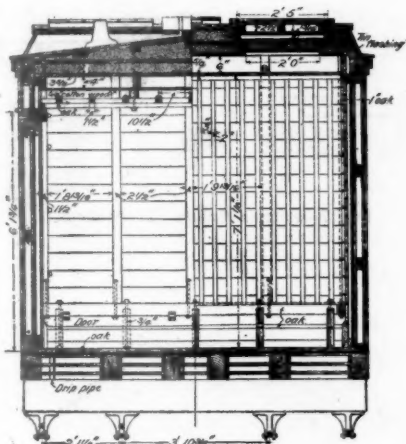
The construction of the ice chest at the centre is very simple, it being built up of double sheathing with two thicknesses of paper between, on a 4-in. frame of oak and provided with vertical runners of  $\frac{1}{2}$  in.  $\times$  2 in. oak strips to insure passage for the descending air close to the walls. The insulation of this box along the sides of the car consists of two thicknesses of paper and one inch of oak, in addition to the general insulation around the car, which is of itself exceedingly good, and is as follows, commencing with the outside,  $\frac{1}{8}$  in. pine, two papers,  $\frac{3}{4}$  in. pine, paper, 2 in. frame (air space), paper,  $\frac{3}{4}$  in. pine, paper, 1 in. felt (compressed to  $\frac{3}{4}$  in.),  $1\frac{1}{4}$  in. frame (air space), paper,  $\frac{1}{8}$  in. cottonwood. So that there are four sheathings, one thickness of felt, six sheets of paper and two air spaces. The floor construction is such as to allow the least possible transmission of temperature between the outside and inside, as there are four sheathings, an extra thickness of felt, four of paper and two air spaces. Good insulation is as necessary as perfect circulation in a car. It is an acknowledged fact that a dead air space produces better results than any other means employed for insulation.

A patent has been granted for a combination of paper





HANRAHAN PATENT REFRIGERATOR CAR.



and twine which make a perfect dead air space. It is durable, light and very simple to construct. The twine is laid in single or double lines a little back from the edge, and when the sheathing and frame are drawn together the twine is imbedded into the wood, producing an absolutely tight joint.

The roof is lined with two layers of cork as making a better protective against the heat due to the direct rays of the sun, and as this thickness is considerable, the lower layer being  $\frac{3}{4}$  in., it will prevent any heat entering from this direction. As is customary, the openings through the roof for icing the car are each double and thoroughly insulated, the lower one lifting out while the upper one swings on hinges. On the inside of each end compartment of the car there is a false roof just above the bars on which the meats are hung. This is simply a  $\frac{3}{4}$ -in. cottonwood sheathing nailed to the lower side of the 4-in. stringers, these latter being spaced so as to form three air flues lengthwise with the car. The false roof extends from within five inches of the outer wall of the ice box to a point three feet from the inner wall of the end of the car.

The advantage of these flues will be apparent when the movements of the air currents are observed. Starting with air in the ice box, we have this air being cooled and sinking to the bottom of the box, coming in direct contact by so doing, with all the ice. It then passes through the openings at the base, into the refrigerating room, where it continues along to the end, gradually rising, as it becomes heated, up to the ceiling, thence passing back to the centre, part of the air near the ends going through the diaphragm (or air flues above the false roof), and part passing along just under this sheathing. These two currents meet at the ice box wall and are drawn into the ice chest by means of the suction produced by the cold air passing out of the chest at the bottom. This heated air now passes down through the ice, is relieved of its heat and odors by coming against the melting ice, and these latter are carried off in the drip through the waste pipe. In this way a constant and

good circulation is maintained of dry air, which keeps the meats or other material freed from accumulating odors.

With express companies, cars are at times but half loaded. In this car, by means of slides at the upper end of the ice box partition, and the hinged flaps over the flues at the base of these partitions, all communication with one or both ends of the car may be entirely cut off from the ice receiver. These flues at the base of this wall are double, there being an upper and lower tier, the upper tier connecting with the box just inside the wall while the lower tier passes in further and connects at the centre. As the flap is also double and hinged across the centre, either one or both of these flues may be opened as desired.

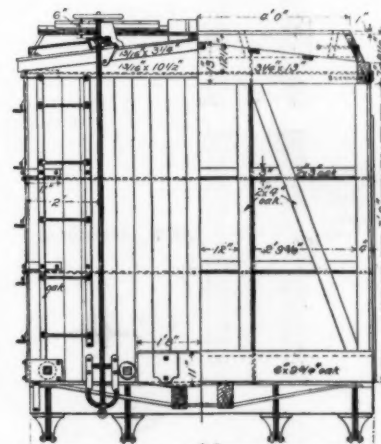
As a result of the perfect insulation, the trip of a car of fresh beef from Chicago in July, 1890, consigned to New York, is of special interest. The car was loaded July 14 with dressed beef, and 6,800 lbs. of ice placed in the car; it was not re-iced in transit during the journey of four days, when the average temperature of the weather was  $92^{\circ}$  in the shade; and on July 18, when the car arrived at destination, the meat was found in splendid condition and 3,275 lbs. of ice was taken from the car; and when the beef was unloaded the thermometer stood at  $90^{\circ}$  in the shade.

The first refrigerator car built under this system ran its first trip July, 1890, and since then the following companies have built and run these cars with good results: The G. H. Hammond Co., International Packing Co., Nelson Morris & Co., Underwood & Co., T. E. Wells & Co., Fowler Bros., American Express Co. and Michigan Central Railroad.

#### Tall Buildings in Chicago.

The nature of the subsoil, the demand for rapid construction of office buildings, and the increasing value of ground space in the city of Chicago, have led to a high development of the metal frame construction for buildings, and among architects this method is often called as the Chicago construction. Strictly the term should only be applied to those buildings which have no self-sustaining outer walls, all the floor, roof and wall loads being carried upon the wrought iron or steel framing. This construction has been evolved from the necessity for a type of building which would settle uniformly from four to six inches during and after construction, without damage to the structure itself, and which would furthermore have the least weight per square foot on the footings of the columns.

Formerly the weight of both the walls and floors was carried entirely by the walls below, which increased in thickness from the top downward. When it became necessary to build higher buildings with from 13 to 20 stories, the necessary thickness of the walls was so great as to preclude their use owing to the waste of floor space; hence the next step was to put metal columns in the walls, which carried the floor loads, leaving to the walls only their own weight. A further step was to remove the wall and in its place substitute a veneer or covering made of hollow tiles, the weight of which is carried at



each floor by the metal construction of the interior of the building, the walls being secured laterally by hooks fastened to the tiling and to the metal framing. This last construction approaches, if it does not reach, the minimum weight per foot of height. The pressed brick facing is either 4 or 8 in. thick, and is backed by hollow tile about 8 in. thick. The columns and girders should invariably be protected by a hollow tile of sufficient thickness to make them proof against collapse in case of fire. This also renders more uniform the expansion or contraction throughout the building.

**Foundations.**—In the construction of such tall buildings, first to be considered is a sufficiently strong foundation. The soil underlying the city consists of blue clay at about 12 or 14 ft. below the sidewalk grade. At a depth of 6 to 10 ft. further down this gradually becomes softer, going down from 40 to 70 ft. before striking rock or solid material. Pockets of a spongy mass coming up to within a few feet of the surface of the clay are sometimes found, and care is taken to determine by borings the nature of the material at various depths before commencing erection. The upper surface of this clay is smooth and quite hard and the soil may be shoveled off easily. In making calculations for footings, a load of about 3,000 lbs. per square foot is taken for the clay.

It has been found in practice that the small foundation piers will take less settlement than the larger ones where the calculations have been made uniformly at 3,000 lbs. per foot. Reason for this will be seen by considering the sustaining power of the clay as somewhat in proportion to the size of what might be termed the sub-base. The angle of pressure from the bottom of the concrete down through the clay being less than  $90^{\circ}$ , the periphery of this sub-base for a small foundation is much greater in comparison to that of a large foundation than the proportion between the areas of the concrete bases as at first figured. On this account many decrease, by a small percentage, the sizes of the smaller foundations.

In laying the foundations it is customary to start with a course of heavy concrete on the clay, then several

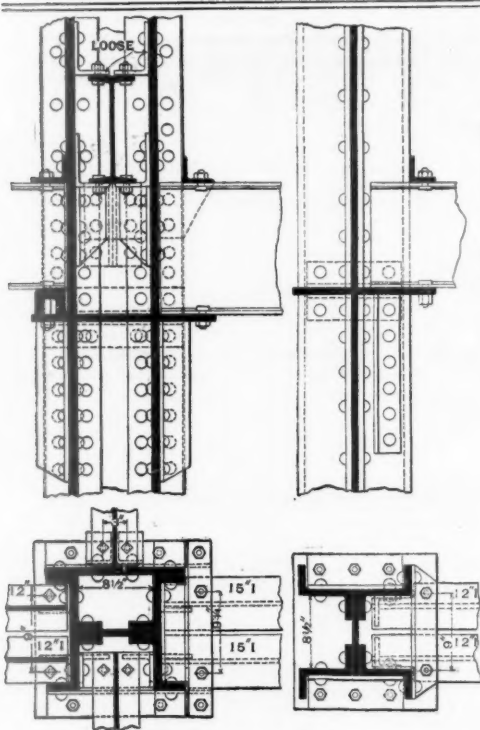


Fig. 2—Beam Connections to Columns for Monadnock Building, Chicago.

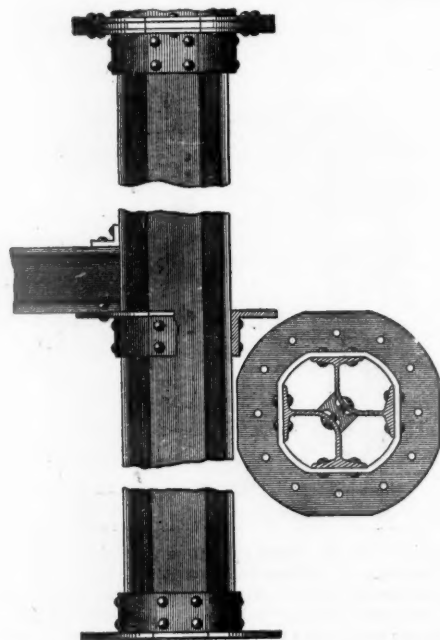


Fig. 8—'Larimer' Column Construction as Used on Newberry Library, Chicago.

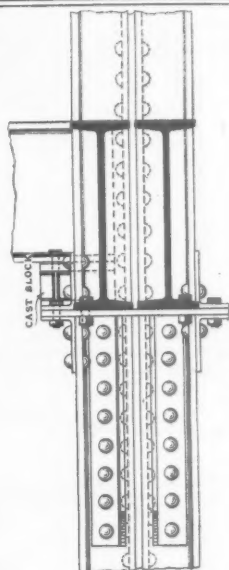


Fig. 3.

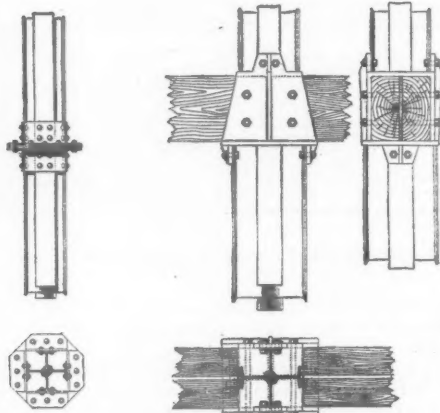


Fig. 9—Connections for 'Larimer' Column.

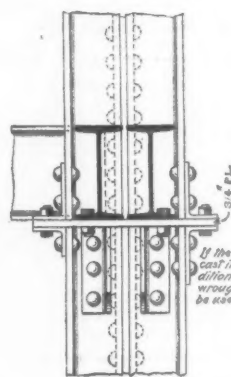


Fig. 4.

Standard Connections of I-beams and Z-bar Columns.

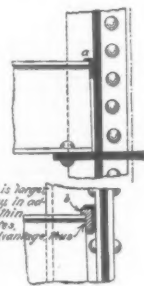


Fig. 5.

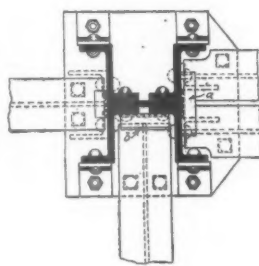


Fig. 6.

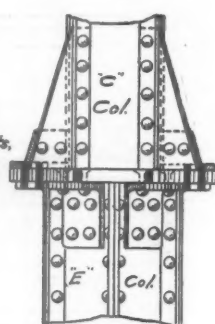
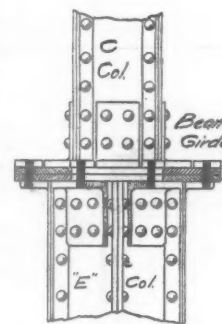
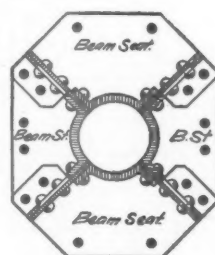
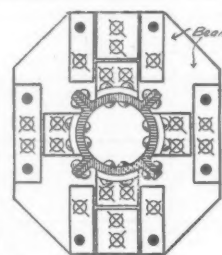


Fig. 7—Phoenix Column Connections.

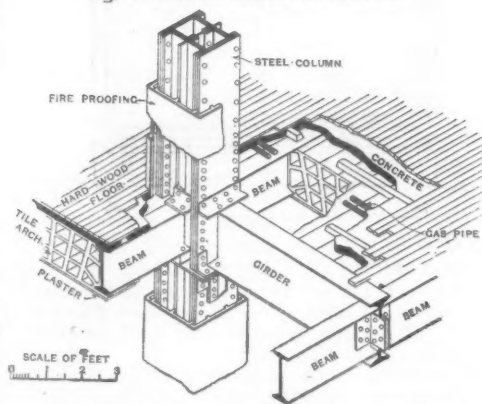
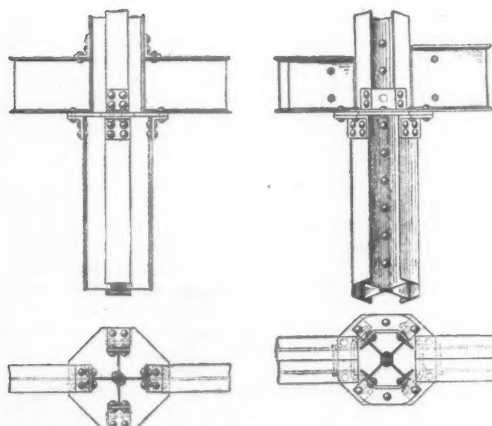


Fig. 10—Isometric View of an Interior Column of 'The Fair.'

#### DETAILS OF TALL BUILDING CONSTRUCTION IN CHICAGO.

courses of railroad iron, or preferably "I" beams, laid with the various courses at right angles with each other, all spaces being carefully filled in with concrete. Upon this is set a large cast iron base plate into which is set the column. In at least one instance the foundation was started by laying courses of oak plank on the clay bottom. This case was not successful as the plank gradually curved downward at the ends on account of the superimposed load, and it is supposed that the cause of the trouble arose from the original calculations having been made for dry plank, whereas after being laid they became wet, and therefore unable to sustain as much pressure. The fault here lay probably not in the principle but in its application.

With extremely high buildings the load per square foot of foundation would become so great as to exceed the bearing capacity of the clay. It would then be necessary to reach rock bottom. This may be done by driving long piles, one on top of the other, until the bottom one touches rock or solid material; the subsoil being somewhat spongy this may be done without much difficulty. Frequently long single piles may be used.

The question is often asked why pile foundations are not used more generally in Chicago, surrounded as the business area is by the lake and river. Pile foundations may be used wherever the building is so situated that the tops of the piles can be maintained permanently under water. This is, however, seldom the case with the tall buildings which are at some distance from the water. The Chicago clay is so impervious that the

height of the water in the lake and river is not the permanent water level under the business centre, which at times is materially lower, so that it is uncertain at what depth it is safe to saw off the piles. In order to properly anticipate the settlement of these tall buildings it has been found necessary to set the buildings from 3 to 5 in. above their proper level.

**General Design.**—In the construction of the modern building, there is a division of labor between the architect and the engineer. After the general design has been submitted, all calculations of strains are made by the engineer, commencing at the top of the building and working down. For office buildings, floor loads are taken at about 150 lbs., about 90 lbs. for dead load and 60 lbs. for live load, and all floors are made of the same strength of girders, whereas the wall loads increase according to the number of floors above and the weight of the wall itself above. There is a diversity of opinion among architects as to how much of the live load should be taken into account. Some consider that the live load for an office building is such an uncertain quantity, both as to amount and location, that it is better to leave it out in their vertical calculations. Others add a certain amount of live load for each floor, only carrying down about one-third in their calculations for strains on the columns. The general practice is to make no calculations for live loads on the footings, for the foundations.

After all calculations are made by the engineers the strain sheet, giving load and cross sections in square

inches necessary for the columns, are submitted to the manufacturers, who make up the columns and girders to suit.

**Erection.**—After the material is on the ground and the foundations are put in, the work of erection of the steel frame buildings progresses very rapidly, as all columns and girders are riveted up and punched at the shops ready for putting in place, so that it is only necessary, on the ground, to put in a few bolts or rivets and draw together with turnbuckles the diagonal brace rods, which are frequently, and should be universally used. To hoist into place the different members, steam cranes, built expressly for this kind of work, are used. One of these was illustrated in the *Railroad Gazette* of Sept. 4, 1891. With such a crane it is comparatively easy to erect two stories in six days of ten hours each, the crane being run up an incline from one story to the other. In the case of the Unity building, the time from the setting of the first floor columns to the finishing of the roof over the seventeenth story was but nine weeks.

One of the great advantages incident to the new system of hanging the walls to the steel framework is seen by reference to the cut of the Unity Building, fig. 1. There was delay in the delivery of the granite facing for the first three stories, above which the facing is to be of a yellow-buff pressed brick. The non-delivery of material in no way hindered the contractors in finishing the framework or upper wall. They commenced the erection of the brick wall at the fourth story, and completed some six or eight stories of wall before the lower facing arrived.





Fig. 1—Unity Building, Chicago.  
C. J. WARREN, ARCHITECT.

The iron framework has been carried up four stories farther than shown in the cut, making 17 stories in all.

*The Frame.*—The wall for each floor rests upon the bottom flange of the outside floor girder (or upon angles riveted to this) and is bound in to the posts by means of bent rods about three-eighths of an inch in diameter. These rods are bent at one end into holes, which are put into the bricks when manufactured, the other end being bent around an angle of the post, so that every fourth or fifth course of brick is securely bound in. The thickness of these brick walls is usually either 4 or 8 in., having a tile backing, except where a fire wall is desired, in which case it may be made either 16 or 20 in., and for the same protection against heat would remain of the same thickness from the top story to the basement.

Not only is the use of cast iron to be deprecated from the danger of blowholes, but also because the fastening with bolts is unmechanical for this class of structure. Where steel is used hot riveting is the rule, and all connections may be made tight and permanent with a minimum liability to looseness. This is of paramount importance in a structure which cannot be inspected from time to time. No engineer considers a bolt connection for bridges as proper when it is possible to use rivets, and as cast iron has been practically abandoned for bridges, it should, probably, for the same reasons, be given up for tall buildings where tension and bending moments are to be resisted. Where bolts are used with steel columns the holes are punched, then reamed  $\frac{1}{8}$  in. and the bolts are turned to fit. Some of these structures have a 100 ft. square base and are 200 ft. high.

The best architects incline toward the use of wrought iron and steel in fireproof buildings to the exclusion of all cast iron; but the wrought iron and steel is invariably surrounded with tiling. Structures of wrought iron and steel construction are designed in a strictly scientific way, as in the development of railroad bridges. Gradually all "rule of thumb" has been eradicated and now calculations are made for the load on each unit of structure, which is thereafter manufactured to do its part with a reasonable margin of safety. Formerly, owing to the uncertainty of the strains and stresses, there was much waste of material, and occasionally a lack of it.

Steel and wrought iron columns are of uniform thickness. They are almost entirely free from blowholes, cold shuts, cinder flaws, imperfect welds, etc., and there are established methods for the detection of such defects. The shapes in which these materials are rolled

lend themselves readily to conservative designs and secure joints, and incidentally do not offer the chance for inexperienced designers to depart from safe construction in order to gain a grotesque or novel appearance. There are several different patterns of wrought steel columns used. The principal varieties are the Strobel or Z-bar, the Phoenix, and the Larimer column. The manufacturers of each claim peculiar advantages for their particular design.

*The Z-bar Column.*—The Strobel column is so well known as to need but little comment, its great advantage being in the fact that the girders may be brought up to the web member, thus bringing the load very close to the centre of gravity of the column. This advantage will be appreciated when it is considered that frequently a heavy load is imposed upon the girder on one side of the column, while the opposite side may be entirely relieved of load, so that if the girder be fastened at a point at some distance from the centre of gravity of the section of the column, there would be produced a considerable canting strain, tending to bend the column. This column was first designed by Mr. Charles L. Strobel for the Kansas City bridge on the Chicago, Milwaukee & St. Paul R. R. five years ago, and its value was so apparent that it is now in general use. Its first use in buildings was in the "Cleveland Society for Savings Building," Cleveland, O., Burnham & Root, architects.

The general system of connections between the columns and girders of this pattern will be seen by reference to figs. 2 to 6. Small brackets are riveted to the web and to the faces of the angles, and over these is placed a plate varying in thickness from  $\frac{1}{2}$  in. up. On this plate are placed the girders, so distanced that the post may be set down from above centrally on to the post below, and fastened by means of small angles to the plate. The girders are fastened to this plate by means of rivets through their lower flanges, and in some cases the top flanges are held firmly to the web of the upper posts with small angles. The later practice followed, however, is as shown in *a* and *b*, figs. 5 and 6, where a small wrought iron gib is dropped in behind the girder between its upper corner and the web of the post; and if this space is large, cast iron may, in addition to the thin wrought plates, be used to advantage. By this method any compression strains which may occur are taken up. The tilting strains are here slight after the tension rods and hollow floor tiles are put in place. When it is desired to have the top flanges of the several girders on the same level, cast iron blocks are used above the post plates under the smaller girders, as shown in fig. 3.

*The Phoenix Column.*—The theoretical advantage and the construction of the Phoenix columns are very familiar. The system followed in connecting these columns with the floor girders is generally as shown in fig. 7. Angles are riveted to the extended fillers and web members, on which a plate is placed, thus sustaining the ends of the girders and the superimposed column in a manner very similar to that with the Strobel bar column, the



Fig. 12—Masonic Temple, Chicago.  
BURNHAM & ROOT, ARCHITECTS.

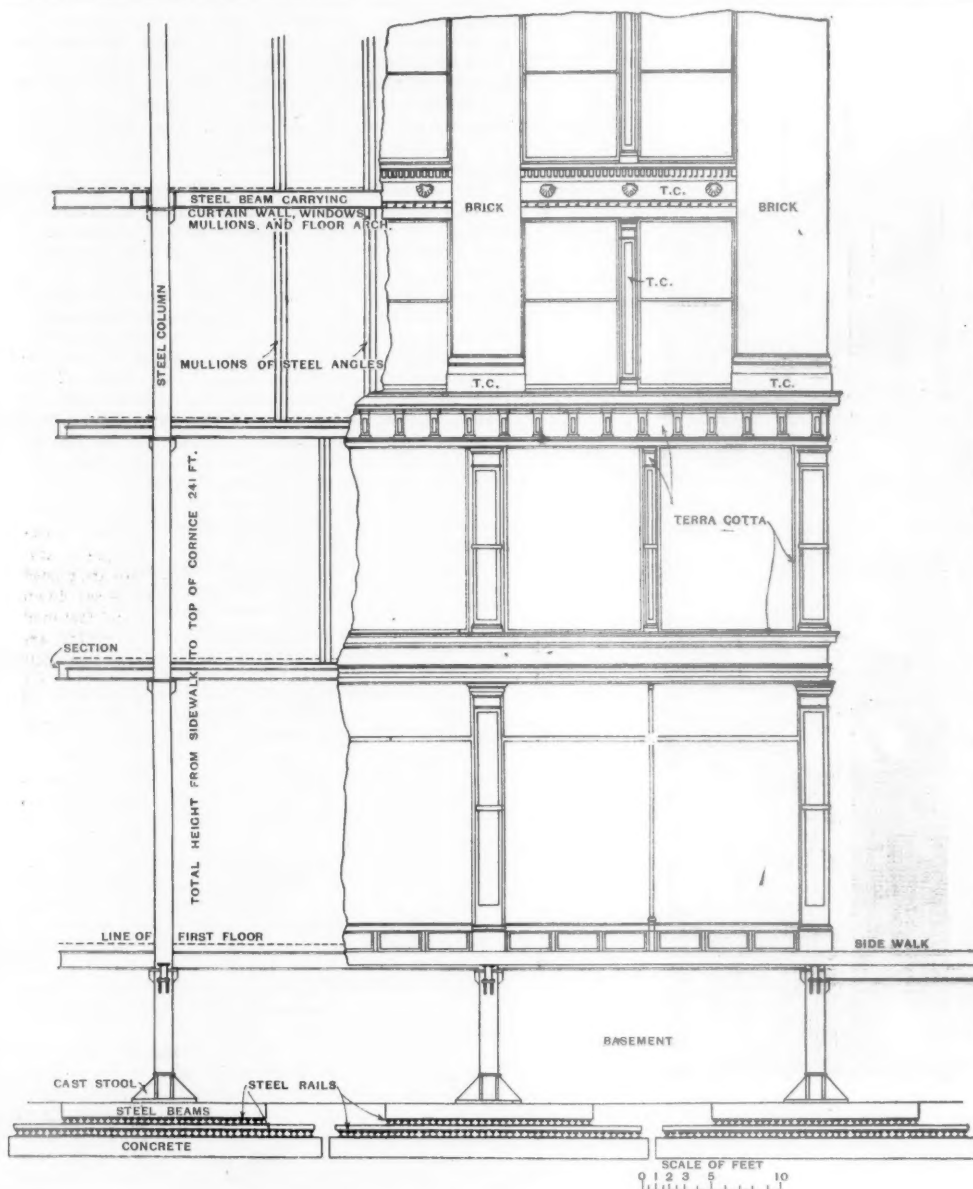


Fig. 11—Details of Construction of "The Fair," Chicago.

W. L. B. JENNEY, ARCHITECT.

upper column in this instance also being held down by small angles. The tilting movement due to the load resting at a point some distance from the centre of gravity of the section of the column referred to in connection with the Strobel bar column, occurs to some extent where this column is used.

**The Larimer Column.**—A column which has more recently come before the public is that known as the Larimer column, manufactured by Jones & Laughlin Co., Limited. This is made up of two I-beam sections, which are bent down along the middle of the web, the two parts being riveted together with a small I-beam filler between (see figs. 8 and 9). The rivets are spaced 3 in. centres for about 18 in. from each end of the column, the spacing being then changed to 5 in. When it is necessary to strengthen the cross-section of this column, this filler is made of two channel sections, and a web plate is placed between them, extending out on either side as far as necessary. This column when made without fillers has this advantage, that but one row of rivets is used, whereas with the Strobel bar column at least two rows are necessary, and with the Phoenix column at least four rows. The system of connections at the ends of these columns is as shown in the figures. Small angles are riveted to the faces of the flanges of the I-beams, and a plate riveted across the top on which the girders rest. Where but two girders touch the column, the remaining faces are used for fastening the upper column down to the plate. Recently, instead of using small angles, this company has taken a square or octagonal sheet and cut it crosswise from the centre out, part way to the edge and have bent these lips down in a press, thus forming a solid and continuous angle.

Another method followed has been to press out in a hydraulic machine a circular sheet to conform in the lower part to the shape of the outside of the flanges of the column, fig. 8. In this way not only the upper flange, but the vertical flange, is made continuous around the top of the column. Also the thickness of the horizontal flange is retained uniform, the thickness of the vertical flange being somewhat tapered. This form of connection is used with the columns in the Newberry Library, of which Henry Ives Cobb is the architect.

In the specifications for the steel for the construction of these tall buildings, the metal is required to stand a

tensile strength of from 60,000 to 68,000 lbs. per sq. in., and to have an elongation of 20 per cent. in eight inches.

## SOME TALL BUILDINGS IN CHICAGO.

Architects.	Name of Building.	Columns.	Height.	Stories.	Walls.	
Burnham & Root	Rookery	cast iron	161	12	heavy	Solid.
"	Monadnock	"	215	16	"	"
"	Northern Hotel	"	168	14	"	Chicago con. veneer walls
"	Woman's Temple	"	"	13	"	Solid.
"	Masonic Temple	box	254	20	medium	Walls carry themselves.
Jenney & Mundie	Ashland	"	"	16	"	"
"	Home Insurance	cast iron	210	16	medium	Walls carry themselves.
"	Manhattan	"	241	17	hung	Chicago con. veneer walls
Cobb & Frost	Fair	"	241	17	"	"
Henry Ives Cobb	Owings	cast iron	160	13	medium	"
"	Cook Co. Abstract	Phoenix	211	18	"	Veneer walls.
"	Athletic Association	"	146	10	"	"
Holabird & Roche	Tacoma	cast iron	165	13	hung	Four cross walls.
"	Pontiac	"	174	14	"	Veneer walls.
"	Caxton	"	150	12	"	"
"	Venetian	"	180	13	"	"
Clinton J. Warren	Unity	cast iron	210	17	"	"
Adler & Sullivan	Auditorium	"	"	( 10 main ) ( 19 tower )	heavy	"

Some specify that the phosphorus should not run over 0.10 per cent. Where cast iron is used the following specifications are often called for. The cast iron piece one inch square and five feet long placed on bearings 4 ft. 6 in. between centres must sustain a load of 500 lbs. centrally between supports. Calculations for cast iron columns are made with a factor of 8 or 10, those for steel columns being made with a factor of 4. Steel columns are calculated for a strain of about 1,200 lbs. per sq. in., but this is only a general statement, as the practice varies with different engineers. With cast iron columns the girders are bolted down to brackets cast on the column, and are also fastened with their webs to wings cast on the column.

The veneer wall construction has been readily adopted for certain classes of buildings since its success was demonstrated by the erection of the "Tacoma" by the firm of Holabird & Roche. This was the first of its kind, although there had been a decided step in this direction in the Home Insurance Building by Mr. W. L. B. Jenney, in that cast iron columns were carried up in the walls, thereby sustaining the floor loads, the walls simply carrying their own weight.

The Tacoma is braced by cross walls running at right

angles, to the centre, and on the east and north ends, it being built in the shape as an L.

Some architects now consider that the riveting together of the beams and columns, and the rigidity of the fireproof arches in the floors and the partition walls prevent any movement of the joints resulting from wind pressure; however, the bending movement of the columns must be carefully looked after, and counters of wind bracing with turn buckles placed between floors where possible, to stand a tilting strain of about 20 pounds per foot. Knees or brackets, as in ship building, are sometimes used to get this necessary stiffness.

**The Fair.**—In figs. 10 and 11 some constructive details of the building known as the "Fair" are given. This will cover about one-half block, 17 stories high, and is 351 x 190 ft. on the ground, and 241 ft. from the sidewalk to the top of the cornice. The building is being erected in sections, so as to allow the immense business of this store to continue without interruption. The lower 8 stories are for the business of the "Fair," which is a general "bon marché." The upper 9 stories are for offices. The exterior is made of brick and terra cotta. In this building there will be 12 boilers for electric plant, elevators, heating, etc. As there was no room for the foundation of a brick chimney, a steel one was substituted, and we believe for the first time in a business building. It is made of a cylinder three-eighths of an inch thick at the bottom and decreasing in thickness toward the top. It is 250 ft. high and lined for 50 ft. with 8 in. of firebrick, and above this with 4 in. of hollow tile and covered on the outside with hollow tile to prevent the heating of the building in summer. The space between the chimney and the tile serves as a ventilator for the boiler-room.

The Manhattan building occupies 150 ft. frontage on two parallel streets. This is a peculiar construction on the cantilever principle. The party walls on either side were very poor and could hold no additional weight, hence it was necessary to carry the division wall on cantilevers, which were in turn supported by the first interior row of columns on both sides. It being impossible to carry high party walls in this way, the two ends of the building were not built as high as the centre. The columns in the Masonic Temple, fig. 12, are built two stories high and placed broken joints. It was thought that this would add strength to the walls, by binding each floor into the next below and above. This arrangement caused a waste in material, as the columns in each case had to be calculated for the strains occurring in the lower of the two stories. Difficulty was also experienced in the methods of fastening floor girders to the centre of columns. This building is bolt connected.

The cost of 16-story steel frame buildings varies with the size of the purse of the estate or syndicate erecting them. Columns, channels and I-beams average about 3.5 cents per lb. and the expense of transporting through the city from the freight houses to the buildings is about \$1 per ton. The cost of erection of material in place after delivery on the ground varies from \$6 to \$8 per ton. The total weight of such buildings depends largely upon how far apart it is necessary to place the posts, and as the weight of the floors varies with their thickness, whether the architect is obliged to use 12 in. or 15 in. beams, and how heavy tiles are required.

## The "Diamond Special" of the Illinois Central.

The arrangement just inaugurated on the line of the Illinois Central in regard to its train service will be of much interest to those going back and forth between Chicago and St. Louis, as it is a step in advance in the matter of elegance and comfort in transportation. The sleepers, designed especially for this run by the Pullman Company, are peculiarly adapted to the requisite standard for the "solid vestibled" train for such a character of passenger traffic.

The arrangement of the compartments giving three staterooms, a drawing room and a smoking room, besides a good number of sections, is quite an improvement in many ways, as it combines the advantages of both styles and allows choice on the part of travelers. The passageway and entrance at the smoking room end are finished in quarter sawed oak, highly polished and deeply paneled, while the smoking room is of African vernis wood of a dark, rich coloring, relieved by embossed gold leather panels and frieze, and containing a high backed sofa of brown figured plush. The water supply throughout is had by the use of air pressure on the tanks underneath the car, as used on the cars turned out by this



company for some time past. The light by Pintsch gas is exceedingly good, and the large chandelier adds much to the beauty of the room with its many gas jets. Beyond the aisle door the finish is in light mahogany. The buffet feature is well appointed.

Stateroom A might be termed the green room, as the fittings and, above the wainscoting, the woodwork are of a delicate pea green with gold markings. Part of the space not occupied by the usual double berth is taken up by a small wicker chair, still leaving ample room. By means of a sliding door the room may be thrown into the next, which is finished in white mahogany, and all embossed and decorated plush parts tinted in canary. The curved door cuts off somewhat from the size of the room but adds to its apparent height. The upper portion of this partition is decorated with bronze grill work and wood spindles, the door having beaded panels of bevel glass.

The figuring and decorations of the main body of the car are in the French Renaissance style, and the general tint being in a terra cotta shade gives a soft and pleasing effect. The arched entrances at either end nearly

freight trains, unless it is perfectly convenient to enforce it. The semaphore in use on the Baltimore & Ohio is so constructed that any one of the blades, when pulled down, is hidden within the post, the post being of such shape and color that it seems always to show a white arm hanging perpendicularly.

**Rules.**—We give first a synopsis of the double track block signal rules of the B. & O. so far as they show peculiarities, and then such of the single track rules as are necessary to indicate the differences in practice.

Trains running by block signal rules are to be governed absolutely by the fixed signals and will not observe the usual rules requiring an interval of time between trains. Green is permission to proceed, "with the knowledge that one or more trains are in the block, keeping a sharp lookout and prepared to stop on short notice." A semaphore hanging at an angle of 45 deg. indicates the same as green (caution). The normal position of the signal is red or horizontal. An operator displaying white or green signals must hold the signals by hand and not fasten them. A train approaching a block station must so run that it can be stopped before the

Operators must always note the number of the engine. Rules 27 and 28 are as follows:

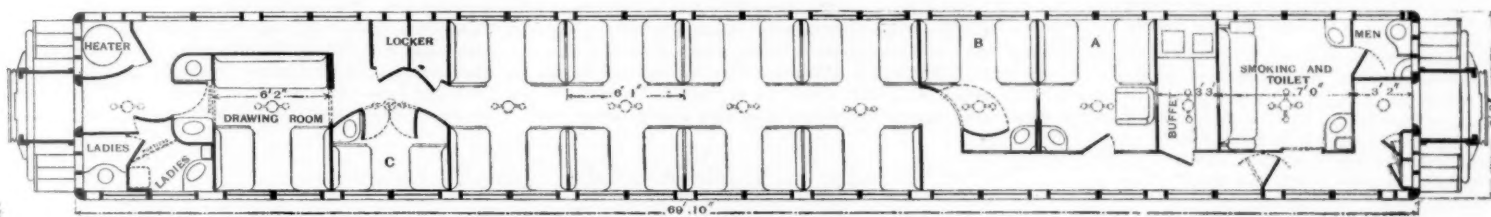
27. Conductors and engineers of all trains will confine their running entirely to the rights given them by the time table, rules and train orders, and at no time depend on these single track block offices or rules to secure the safety of their trains. In all cases they must know beyond a doubt that they have the right to the track before they can proceed.

These rules do not relieve trainmen from observing all rules in regard to the protection of their trains, and the instant any train stops or comes down to very slow speed between block stations, a flagman must go back at full speed to protect.

28. Train dispatchers are also cautioned to exercise as much care and vigilance in the handling of trains by telegraph, as though this system did not exist, and in no instance will they assume to be relieved of any responsibility on this account.

#### Bridge and Shop Notes.

The Elmira Bridge Co. has recently added to its shop a heavy punch, which, like many of the other tools, was designed by the president, Mr. Charles Kellogg. It is for use on wide plates and has a reach of 38 in. The special feature of this tool is that it can be used on heavy material and is practically free from spring, whereas even the heaviest punches, with cast-iron jaws, have more or



NEW SLEEPING CAR—ILLINOIS CENTRAL RAILROAD.

spanning the car for its entire width and bordered with stamped plush have a close similarity to heavy carving.

Stateroom C is a novel design for this class of compartment, and is finished in steel gray the same as the drawing room, though this latter has a ground of white and with gold decorations gives a decided ivory effect. The ladies' dressing room at this end is in two compartments, separated by draperies, there being no lock on the first outside curved door. By the use of large glass panels in the several staterooms on the aisle side, by drawing aside the curtains one is enabled to readily obtain views from both sides of the car on account of the arrangement or spacing of the windows.

The combination coach and smoker used on this train is fully up to the general standard of the rest of the train, the smoking room being brilliantly lighted by gas and the floor laid with a heavy Wilton carpet, while 18 movable, mahogany colored wicker chairs with brown frieze cushions are suggestive of luxury and ease.

By means of such a train as this latest one of the Illinois Central's, leaving Chicago in the evening and arriving at its destination early the following morning, one may accomplish an amount of business in the various larger cities with the minimum of discomfort, which would be impossible with modes of travel and classes of rolling stock run on the trunk lines a few years ago. With so many important cities within twelve hours' ride of each other, one may make the round, having a full day at each point, and by using the nights for traveling with the "specials" on some of the lines have all the conveniences of well-appointed hotels, and with almost no fatigue from the motion of the cars on account of the attention now paid by the motive power departments to the construction of the trucks.

#### The Block System on the Baltimore & Ohio.

Among the sections of road included in the 290 miles recently reported as being operated under the block system on the Baltimore & Ohio, are one of five and one of 22 miles in length, that are single track. As single track blocking is interesting a considerable number of railroad officers now, and as the details of the plan here used afford material for instructive comparisons with the blocking systems heretofore described in these columns, we give below the distinctive portions of the B. & O. rules. The main difference between this plan and that on the Ohio lines of the New York, Lake Erie & Western, described in the *Railroad Gazette* of Oct. 9, is that there the train dispatcher directs every movement of the station operators, while here he not only takes no part in the work, but is distinctly told to ignore it, so far as his own vigilance is concerned.

The longest single track section is between Gaithersburg and Washington Junction, and the lengths of blocks are as follows:

GAITHERSBURG,	5.0
GERMANTOWN,	2.6
BOYD,	4.1
BARNESVILLE,	2.6
DICKERSON,	3.5
TUSCARORA,	4.5
WASHINGTON JUNCTION,	

The road is double track both sides of this section. From 60 to 80 trains a day is the usual movement. It will be seen that absolute blocking is not attempted with

engine passes the signal if the signal to proceed is not displayed. Blocking behind passenger trains must be absolute, with the following exceptions: A train intending to use a crossover between the block stations may be admitted under a green signal in certain circumstances; in case the telegraph line fails a train may be admitted by a written notification from the operator; a passenger train may follow a freight under a green signal in 12 minutes. A freight train may follow another freight under a green signal in seven minutes. When near meeting points and other places where celerity is important this interval may be reduced to three minutes.

A train desiring to use a crossover must notify the block operator at the entrance of the section, who must direct the block operator at the other end to display red for the other track. This last operator must then admit no trains into the block until after he has given them specific notice that a train is using the crossover. Operators must not give trains permission to use a crossover, under this rule, except when both tracks are clear throughout the length of the section.

When a passenger train is stopped by a block signal at a station where it receives or discharges passengers, it may run to the platform, and if the block signal cannot be seen by the engineer from his location, the conductor must, after the proper signal has been displayed, personally direct him to proceed.

Operators holding orders for a train must display a train order signal in addition to the block signal. Yard engines must clear the time of passenger trains 10 minutes, and the conductor must notify the nearest block station when he has cleared the main track. Immediately after a work train has entered a block the operator must display for following trains a green flag or light, in addition to the block signal, and keep it displayed until the work train has left the section. Not more than one work train will be allowed in a block at the same time.

**Single Track.**—All trains running toward each other and all passenger trains running in the same direction must be run under absolute block, except when the telegraph line fails, when the operator must give the train a written notice and then permit it to run under a green signal. No passenger train may follow a freight train or a freight follow a passenger train in the same block except when the line fails, as just noted. Operators must have a full understanding with each other and before admitting a train be absolutely certain that there is no train on the block running in the opposite direction. The method of procedure is as follows:

(Washington Junction) K. S. to (Tuscarora) N. E.: No. 2 is next, what is last, east and west?  
N. E. to K. S.: No. 5 engine 837, west, at 12:35 p. m., and extra east engine 287, at 12:05 p. m.  
K. S. to N. E.: Hold for No. 2, engine 835.  
N. E. to K. S.: Will hold for No. 2.

Signed.....Operator.  
The operator must not sign this until he has displayed the holding signal.

Work trains must be at regular telegraph stations to meet or pass other trains. Rule 21 is as follows:

21. As the block system on the single track on the Metropolitan Branch will be in the hands of the operators exclusively, they are hereby cautioned to closely watch the time and movements of all trains. They must copy train orders sent to all trains that will meet at their respective stations and acknowledge their understanding to train dispatcher's office by saying, for example: D. S. to D. O., "I understand No. 1, engine 1,401, and No. 6, engine 844, have orders to meet at Boyd," giving operator's initials and office call.

The form for reporting trains is, first, call of reporting station; second, number of train (and engine); third, time of leaving.

less spring, particularly if used on material thicker than three-eighths inches. Another excellent machine recently added to the shop is a movable riveter driven by compressed air and especially adapted to driving rivets in columns, posts and chord sections where the flanges of the channels or angles are turned in. Under the practice of several years ago such rivets were driven by hand, and at best could not compare with machine-driven rivets. The shop is now busy finishing a part of the Memphis Bridge and working on contracts for the Lehigh Valley, Erie, New York Central and the Baltimore & Ohio. The Mohawk & Hudson has also recently placed a contract here for four lattice girder spans.

For several years past the Passaic Rolling Mill Co. has given the use of a large room in its office building to its employees. This room has been made comfortable and is used as a reading room. In addition to the local papers there are kept on file the leading New York dailies, a number of weeklies and several magazines. During the winter it is occasionally used in the evening for lectures, musical entertainments and dances, probably half a dozen such entertainments being given during the season. It is practically supported by the employees. This company is working on two plate girder spans for the Erie & Wyoming Valley, some building work for Cuba and several large roofs.

The firm of J. F. Bailey & Sons, of Philadelphia, have withdrawn their interest in N. D. Doney & Co., successors to the Elmira Iron & Steel Rolling Mill Co., and have been succeeded by B. Maurice. All difficulty arising from the strike of last year, which occasioned the shutting down of the latter company, is now practically at an end, and the universal mill is running smoothly at full capacity, which is about 150 tons per month. The mill company now leases the universal mill to Doney & Co., but is anxious to dispose of the entire property, comprising a blast furnace of two stacks, puddling furnaces and the angle and universal mills.

The Catasauqua Manufacturing Co. has succeeded in starting its rolling mills at Catasauqua and Fullerton in spite of the strike of the past five months, and is now running smoothly.

For the past year the Union Bridge Co. has been making important additions and improvements to the shops at Athens, Pa. The principal changes have been in the yard, the building of a new eyebar plant, an extension to the riveting shop and the arrangement and rearrangement of a number of tools. The old material and shipping yard to the north and west of the shops has been cleaned out and leveled, new skids and tracks have been laid, and greater facilities and increased surface secured. It is now used only for receiving and storing material, and is admirably arranged so that material of different sizes and for the several contracts can be readily located and handled. A new yard for storing and shipping finished work has been laid out north of the shops and is traversed by the large traveling crane of 90 ft. span which was brought from the Buffalo shops. The new eyebar plant is located to the west of the shops and across the main street of the town, opposite the office. It consists of a brick building 90 ft. front and 140 ft. deep and an adjoining frame building 40 ft. front and 150 ft. deep. At each end of the former are situated the heating furnace and a heavy hammer. At the west end is a heavy upsetting machine and a similar one will shortly be placed at the east end. By this arrangement, eyebars will be manufactured without reversing them and with a minimum amount of handling. The frame building is



used for straightening and boring and the boring mills are similarly arranged at either end of the building. Adjacent to these buildings are the testing room, with the well known machine for testing heavy bars, and a special shipping yard. The extension of the riveting shop is 80 feet long and the full width of the shop, viz., 200 feet; it gives much needed room for handling and storing members in the process of manufacture and assembling field connections, chord sections, portals, etc. A number of improvements have also been made in the addition of new tools and the rearrangement of old. These are particularly noticeable in the steel department, where there are now two gangs of "box" radial drills, one of 22 and the other of 26, besides several single drills scattered about the shop.

The shops are finishing the last large span for the Memphis Bridge, several spans for the Houston, Central Arkansas & Northern, and a small draw span for the Chicago & Erie. They are working on several heavy spans for the Erie and some lighter work for the Lehigh Valley, and have contracts for two 153-ft. spans for the Cumberland Valley, a draw span for the Texas & Pacific, some lighter work and a number of eyebar contracts for other bridge shops.

#### A Shallow Bridge Floor.

Several engineers have expressed considerable interest in the examples of shallow bridge floors that we have given lately. It may be of further interest to note a method used by the Chicago & Western Indiana in one of three bridges crossing the Illinois canal by which the floor is hung from above.

This is a double track, two truss through, pin connected span, 105 ft. between centres of end pins, 30 ft. between centres of trusses and 23 ft. in height between centres of chord pins. The span is made of four panels, 23 ft. 3 in., and one panel 12 ft., this latter being the amount of the skew in the width of the bridge. The clear width for each track is only 13 ft. 10 in., instead of 14 ft., as is usually allowed.

The floor beams are secured to the posts by diagonal suspension beams, riveted to the beam at one end and to the post at the other. The beams are really for a single track load, extra strength being furnished for their support between the two tracks by suspenders from the heavy, latticed beam top lateral struts.

The intermediate longitudinal girders are riveted between the floor beams, and have their top faces several inches above those of the former. The ties are cut to length and rest on shelf angles fastened to the web of the stringers at such a height as to leave the top of the tie below the top of the stringer.

The bottom lateral system is of the Warren girder type, of angle bars between each set of stringers, the two sets of stringers being connected by angle iron struts at three points in each panel.

The assumed moving loads per lineal foot of track are for chords and end posts 3,500 lbs., for web members 4,000 lbs., for floor and suspender members 5,000 lbs. The heavy engines used give a loading for floor beams of 4,300 lbs. and for stringers of 4,484 lbs. per foot of track. The abutments of this bridge have recently been thoroughly repaired, the south abutment having been entirely replaced. Several years ago this wall was anchored back to "dead men" by two 2-in. rods; these proved, however, insufficient to hold it from moving out of line (settled north and west about 6 in. and the top swung north about 1 ft.), and the Joliet stone became cracked and badly broken into layers and small pieces, hence the necessary overhauling.

By the adoption of such a plan as here followed the designer may cut down to a minimum the depth of his floor, as he obtains his strength from the heavy top laterals, for which he may utilize as much vertical distance as necessary. The suspension of the centre line of the floor by means of hangers made up of angles and plates is simply one way of building a two truss bridge where three trusses might be used, and no gain in the depth of the floor over a three truss double track, or a single track bridge, would result, and as one would still be obliged to devise some scheme for reducing the height from the bottom clearance line to the top of the rail, the design here employed does not of itself accomplish all that is required in many cases for canal and railroad crossings. For this reason such a method would not be used except under special circumstances.

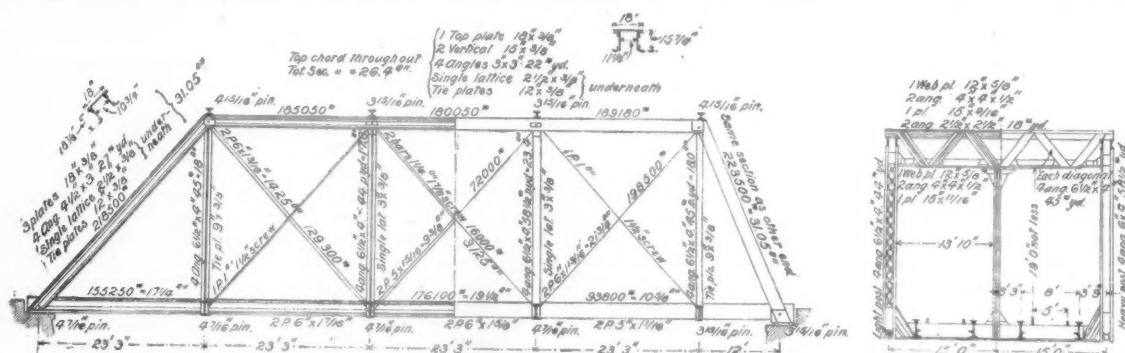
#### The "Multiple Speed" Railroad.

The elevated movable sidewalk which has been under construction at Jackson Park, on the World's Fair grounds, by the Columbian Movable Sidewalk Company, is about completed. The details of the platforms were illustrated in the *Railroad Gazette* Sept. 11. It is expected that the machinery will be in operation within a week. The entire trestle is finished and the track has been laid; the stationary roof over the structure is completed and has received a canvas covering.

The three 30-H. P. motors are mounted on the cars and ready for operation. The remaining 72 are on the track, and the employees of the United States Rolling Stock Company are now engaged in putting on the flexible rails and the top platform. The Thomson-Houston Company has built a power house containing a 125-H. P. boiler and an "Ideal" engine of the same capacity to run a dynamo of 107 H. P., which is also in place.

The machinery was run for the first time on the 10th inst., when it was tested thoroughly and found to work satisfactorily. A suitable switch house has been built on the trestle for the operation of the railroad by a switchman, and there are, in addition to this, fifteen safety switches distributed along the trestle, which allow the instantaneous stopping of the train by the mere pressing of a button. The staircases and approaches for the admission of passengers, as well as ticket office, are finished. It is now thought that the entire structure will be completed within a few days, but passengers will not be admitted until all machinery, axles and bearings, which are new, have been allowed to run for some time, to insure the smooth running of the rolling stock. The flexible rail will be put on the new wheels at once, and will require considerable mechanical skill.

The current used is about 500 volts, and is taken by the motors from a trolley wire running below the outer or slow-moving platform, by the usual form of spring trolley. The length of the track as constructed is 900 ft., raised about 30 ft. above the ground, and it contains several tangents, besides some very sharp curves, part of



105-FT. DOUBLE TRACK THROUGH SPAN—CHICAGO & WESTERN INDIANA BELT RAILWAY.

which have but 75 ft. radius. The object of this extreme sharpness of the curves is to demonstrate the practicability of the scheme under most trying circumstances.

Of course in a system of this character it is necessary that each motor (spaced equidistant on the periphery) shall pull the cars following it and shall not push those ahead, although the entire system is connected and moves as a unit. In order to accomplish this the connections must be carefully adjusted, those between each of the trailers being solid pin plates, and those just ahead of the motor cars being open links to allow a certain amount of play. The motors are in each case placed below the platform and between the axles, so that complete control of the movement of the mechanism is had from the switch house, though, as stated above, the current may at any instant be cut off by any of the small push buttons placed at intervals along the line.

The movable flexible rails are welded in lengths of 90 ft., and these in turn riveted up, and set in metal runners on the under side of the high speed platform, so that there is a slight motion between these, in addition to that between the rail and wheels on which it rides. The running of the cars is smooth and even, and it is anticipated that soon the device will be operating regularly for the public, when, on account of its novelty and adaptability to various purposes, it will attract considerable attention.

#### The Canadian Pacific Award.

Last week saw the end by arbitration of one of the greatest railroad cases ever settled in Canada—the claim of the Canadian Pacific Company against the Dominion Government in connection with the Onderdonk contracts in the Rocky Mountains. The litigation has lasted for nearly four years. In place of the ten millions of dollars originally claimed, the company only received \$579,000, each party paying its own costs. Eminent counsel and distinguished engineers were engaged by the company to strengthen its case, and the Government was forced to follow suit. The mountain sections of the road were inspected over and over again, and there were long arguments by the lawyers at numerous sittings of the Board of Arbitrators.

The amount of the award was a surprise; the general opinion was that, having reduced its original claim of \$10,000,000 to about 60 per cent., the Canadian Pacific would be awarded about \$2,000,000 or \$3,000,000. The claim of the Canadian Pacific against the Government in respect of the British Columbia section of the road arose under the following circumstances: In 1879 the Dominion Government entered into a contract with Andrew Onderdonk to build that portion of the railroad between Kamloops and the terminus at Port Moody, B. C. Under this contract operations were commenced in the

spring of 1880, and considerable work was done during the year. In October, 1880, the Canadian Pacific syndicate was formed, and under the terms of the agreement with the Government these five mountain sections, some 230 miles, were to be completed under the Government contract with Onderdonk and handed over to the company when finished. Accordingly the work on these sections went on under the Government contracts and was completed in the summer of 1885, but the sections were not handed over to the company till the following year. Prior, however, to the transfer of these sections the company raised objection to the character of some of the work done by the Government contractor, alleging defects and deficiencies in the construction of these sections, and making a claim against the Government therefor.

The claim culminated in a reference to arbitration in January, 1888, the arbitrators being Chancellor Boyd, of Ontario, Mr. T. C. Keefer, C. E., of Ottawa, and Mr. Gregory, C. E., of New Brunswick. The questions left to the arbitrators were: To ascertain whether such defects and deficiencies existed in the construction of these mountain sections, and, that having been done, to ascertain what amount the company was entitled to in consequence. The arbitration was proceeded with on those lines, there being meetings in British Columbia in the summer of 1888, the Board sitting at stated intervals there as well as at Ottawa, Toronto and Dalhousie, N. B., up to the summer of the present year. Necessarily an immense amount of evidence was taken, running

up to thirteen or fourteen thousand printed pages. The argument of the case alone, which took place at Ottawa, occupied 34 days.

After this long and exhaustive argument the arbitrators gave an interim decision, in which they found certain lines of liability and eliminated certain other items from the claim. The company thereupon prepared the money particulars of their claim upon the lines of argument laid down by the arbitrators, and the claim of the Canadian Pacific, which originally amounted to about \$10,000,000, was by these particulars reduced to some \$6,000,000. Upon this claim as reduced further evidence was taken, and every section of the railroad was closely inspected by the arbitrators, with the result that they made further eliminations from the claim, till the claim of the company, as finally before them, was something under \$4,000,000.

The arbitrators met in July last for a final decision. On Oct. 6 the secretary of the Board of Arbitrators, L. K. Jones, notified counsel on both sides that the award had been made, and was ready to be taken up by either party upon payment of a balance for expenses amounting to about \$25,000. This by no means represents the entire cost of the arbitration, which must amount to something like a quarter of a million dollars, most of which has already been defrayed by the parties to the case from time to time, each paying its own witnesses and share of the cost of transportation and the like, during the progress of the arbitration.

According to the agreement of reference the arbitrators are bound to point out, besides the amount of award, the exact localities upon the Onderdonk contracts where the defects or deficiencies in the construction of the railroad in regard to which the claim was made may exist. Another important point is, that the amount awarded to the Canadian Pacific must be applied toward remedying such defects, and these improvements, whether to be made by the government or the company, must be executed to the value of the sum mentioned in the award and carried out under government inspection.

#### The Tacoma Shops of the Northern Pacific.

There has just been built at Edison, Washington, near Tacoma, one of the most complete railroad shop plants in the country. These shops are the property of the Northern Pacific and will be used, not only as the general Western repair shops of the road, but it is also the intention of the company to build a large portion of its freight equipment here. An abundance of yellow fir to be had at a low price, makes it possible to do this work here at a considerable saving.

It was originally the intention of the company to place these shops in Tacoma, at the head of the bay, and a site was prepared for that purpose in connection with the company's freight yard. On account of the constantly



increasing freight business of the road, it was decided to devote the entire space to the yard and the location of the shops was changed to the present site.

The plant covers 20 acres; the floor space of the buildings aggregates 221,370 sq. ft., while nine miles of working tracks are necessary for serving the buildings. By reference to the accompanying cut it will be noticed how well the buildings are placed with relation to one another.

The plans were prepared and the work done under the direction and supervision of Mr. J. W. Kendrick, Chief Engineer of the road. Mr. Chas. S. Behler, Assistant Engineer, was in immediate charge of the work from its inception. The essential features of the car shops at Como, and of the locomotive shops at Brainerd, Minn., are embraced in the new shops. With the single exception of the dry lumber shed, the walls of the buildings are of brick and stone. The roofs are supported by iron trusses, and are covered with No. 26 sheet steel with standing seam. The materials used in constructing the buildings were obtained largely in the vicinity of Tacoma. The general contractors for the erection of the buildings were Messrs. Arthur McMullen & Co., of Minneapolis, Minn. They began work on June 1, 1890, and had completed the contract on Oct. 15, 1891. All the new machine-tools, etc., were furnished by Messrs. Manning, Maxwell & Moore, of New York. The roof trusses were supplied by the Union Bridge Co. The machinery for collecting and removing shavings and sawdust from

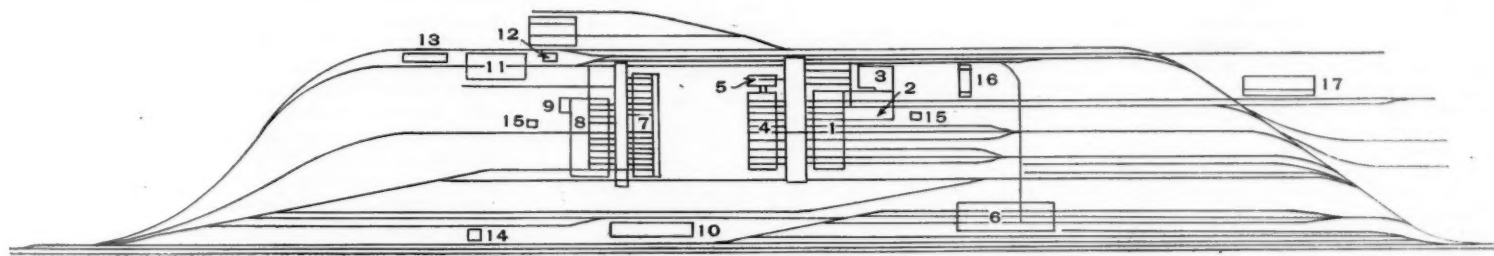
gines or cars. Electric signals connect the different shops with the engine room, and pressure is put on when signaled for. It is the intention to install an air-brake instruction room at an early date.

The distribution of steam for heating and power required great care both in planning and constructing, owing to the unusual distances between the buildings. In some cases it required over 1,500 ft. of mains to connect shops with the boiler room, and it is necessary to convey steam more than 1,000 ft. to some of the smaller engines. In order to provide for the great amount of expansion, the radiators were mounted on wheels permitting them to move as the pipes forming the mains expanded and contracted. The variation in length of some of the lines amounts to 3 ft.

There are two systems of piping for steam, one of them supplying steam for power and testing and the other for heating. There is also a system of hot water supply for the paint shop.

Each building is supplied with high pressure steam from the heating mains and is provided with a pressure reducing valve and other apparatus. The buildings containing engines are so connected that the exhaust steam may be used for heating, if desired. All of the engines are provided with oil separators, which remove the grease from the exhaust steam before it enters the heating system. The water of condensation is returned to the steel tank in the boiler room from which it is pumped into the boilers, making possible the greatest

engaged during the last four months in making examinations of railroads, railroad terminals, harbors, universities and technical schools. Also in inviting, personally and by letters, the engineers of Europe to the international engineering congress which it is proposed to hold here in 1893 under the auspices of the World's Congress Auxiliary. My professional intercourse with many eminent engineers gave me a good opportunity, whenever I met them, to explain the object and the scope of the congress. The position as Chairman of the General Committee of the World's Congress Auxiliary on Engineering Congresses, and that of Chairman of the Executive Committee of the General Committee of the engineering societies of the United States and Canada, enabled me to bring this subject in an official manner before engineers and before their various associations. I invited, personally and by letter, 36 engineering associations. Although most of the associations were in vacation from June to October, yet I have received from many of the secretaries, and personally from several of the presidents and other members of their councils, not only an assurance that their associations would accept the invitation to participate in the congress, but also expressions of the great interest which these important associations of engineers have in the proposed congress. Not only the engineers composing these associations, but the engineers of the governments, especially of France, Germany, Holland and Belgium, evinced the greatest interest in our congress. The inter-



TACOMA SHOPS, NORTHERN PACIFIC RAILROAD—GENERAL PLAN.

1. Coach repair shop.
2. Wood-working shop.
3. Engine-house and steam-heating room.
4. Paint shop.
5. Paint shop storehouse.
6. Freight repair shop.

7. Boiler, tank, tin and copper shop.
8. Machine shop.
9. Engine house for machine shop.
10. Office and storehouse.
11. Blacksmith shop.
12. Storehouse for boiler iron.

13. Coal and iron storehouse.
14. Oil house.
15. Laboratories.
16. Dry kiln.
17. Lumber shed.

the wood-working shops were furnished by the Allington & Curtis Manufacturing Co. The dry kiln apparatus is from the factory of Messrs. B. F. Sturtevant & Co. The oil house tanks were built by Messrs. Kinney Brothers, of St. Paul. Messrs. Cofrode & Saylor supplied the 10 small turn tables, which are used in connection with the system of transfer tracks extending through the various buildings for the purpose of moving heavy material.

The power for operating the machinery is furnished by two Reynolds-Corliss engines, built by Messrs. E. P. Allis & Co., of Milwaukee, Wis. One of them is in the engine house and steam heating room and the other in the engine house for the machine shop. These engines have cylinders 18 in. in diameter and 42 in. stroke.

Steam for engines and heating is generated in Babcock & Wilcox water tube safety boilers, of which there are six, with an aggregate capacity of 625 H. P. The boilers are in three batteries of two boilers each, and will be fed by two Worthington duplex steam pumps, each 10 x 6 x 10. The power plant also includes two Armstrong & Sims engines, 9½ x 12 in., and speed 200 revolutions per minute.

The Edison General Electric Co.'s system is used for lighting, operating two transfer tables, 15 H. P. each, and a number of small motors. The electric plant includes the following, which is controlled by a complete regulating apparatus: Two dynamos, capacity 1,000 lamps, 16 candle power each; installation of 1,000 lamps, and all necessary controlling devices. The dynamos are run by a McIntosh & Seymour automatic cut-off engine, 12½ x 12 in.

The following structures comprise the plant: Coach repair shop, 100 x 243 ft., two stories in height, the cabinet shop being located in the second story of this building; wood-working shop, 90 x 152; enginehouse and steam heating room, 42 x 74; paint shop, 90 x 242; paint shop storehouse, 35 x 90, two stories; freight repair shop, 90 x 302; boiler, tank and copper shop, 80 x 321; machine shop, 130 x 244; engine house for machine shop, 40 x 40; office and storehouse, 43 x 156; blacksmith shop, 80 x 192; boiler iron storehouse, 25 x 50; coal and iron storehouse, 28 x 150; oilhouse, 43 x 60; two lavatories, 26 x 42 each; dry kiln, double, 40 x 72; dry lumber shed, 40 x 225; chimney, 150 ft. high, diameter of flue, 6 ft.

There are two transfer tables; one of them is 40 ft. in width and the other 70 ft., each has a range of travel of 325 ft. These tables were built by the Industrial Works, of Bay City, Mich., and are equipped with Sprague motors.

The buildings have an abundance of light, being provided with skylights and clear stories. Air-brake testing apparatus, controlled in the engine room, extends through the various buildings, making it possible to adjust the air-brake appliances without moving the en-

economy. If the exhaust steam is not used for heating it is discharged into the sewers.

In order to obtain the necessary amount of radiating surface there were used over 12,000 sq. ft. of Joy's improved draught tube radiators and an equally large amount of coil surface. The pipe forming the mains is insulated with Flegle's air space covering to prevent radiation.

The temperatures to be maintained in the various buildings are: Woodworking, coach, machine, boiler and tin shops, 55°; freight repair shop, oil house and lavatories, 50°; paint shop and paint shop stock room, 60°; office and storehouse, 70°. Messrs. W. F. Porter & Co., of Minneapolis, Minn., were the contractors who constructed the steam heating plant, which is the most extensive one contained in any railroad shop in the Northwest.

The paint shop and boiler house have concrete floors constructed in the following manner: 10-in. bed of sand, well-rammed; 3½-in. layer of concrete, composed of four parts each sand and gravel and one part of cement; before it is set, there is added a 2-in. layer, made of five parts of coarse sand and one part of Portland cement which is thoroughly tamped. The finishing coat, one-half inch thick, is composed of equal parts of Portland and sand, and is incorporated with the one next below by means of tamps having projecting teeth. It is then troweled to a smooth surface.

The general charge of the shops will rest with Mr. H. H. Warner, Master Mechanic, assisted by Mr. C. A. Phipps foreman of car repairs. The shops will, of course, be under the control of the Superintendent of Motive Power, Machinery and Rolling Stock. The equipment of tools and machinery is remarkably complete.

#### Engineering at the World's Fair.

Among the series of congresses to be assembled at Chicago during the Fair of 1893 engineering will have an important place. The Department of Engineering includes the construction of railroads, canals and tunnels; river and harbor improvements; water-works, sewerage, and drainage; bridges and other structures; also mechanical, mining, metallurgical, military and naval engineering. This department is under the charge of a local committee composed of the following gentlemen: Mr. E. L. Corthell, Chairman; Mr. D. J. Whittemore, Vice-Chairman; Mr. E. H. Izard, Mr. William Forsyth, Mr. C. L. Strobel, Mr. Robert W. Hunt, Mr. John W. Cloud and Mr. Joseph Hirst. This committee will be assisted by an advisory council which will be composed of eminent engineers of the world. The following report has been made by Mr. Corthell, the chairman of the general committee, who was appointed as the special commissioner for the World's Congress Auxiliary abroad:

I have just returned from Europe, where I have been

engaged during the last four months in making examinations of railroads, railroad terminals, harbors, universities and technical schools. Also in inviting, personally and by letters, the engineers of Europe to the international engineering congress which it is proposed to hold here in 1893 under the auspices of the World's Congress Auxiliary. My professional intercourse with many eminent engineers gave me a good opportunity, whenever I met them, to explain the object and the scope of the congress. The position as Chairman of the General Committee of the World's Congress Auxiliary on Engineering Congresses, and that of Chairman of the Executive Committee of the General Committee of the engineering societies of the United States and Canada, enabled me to bring this subject in an official manner before engineers and before their various associations. I invited, personally and by letter, 36 engineering associations. Although most of the associations were in vacation from June to October, yet I have received from many of the secretaries, and personally from several of the presidents and other members of their councils, not only an assurance that their associations would accept the invitation to participate in the congress, but also expressions of the great interest which these important associations of engineers have in the proposed congress. Not only the engineers composing these associations, but the engineers of the governments, especially of France, Germany, Holland and Belgium, evinced the greatest interest in our congress. The inter-

est in the congress among the engineers of Great Britain and the officers of the great engineering societies of that country was not less than that shown on the continent, and I received here also promise of support for our congress, and the expression of a desire to attend it which was universal. I might say here that in all the countries which I have visited, nearly all the engineers whom I met promptly signified their intention of coming to the congress and the exposition. By invitation I attended the annual convention of the Mechanical Engineering Society of Germany, held at Düsseldorf. This society numbers about 6,000 members, the council of which decided to accept our invitation to take part in the congress. I was also informed by the president of the Society of Civil Engineers and Architects of Germany, which numbers about 6,000, that they had acted on the invitation and had gladly accepted it. Letters have been received also from engineering societies in countries which I was not able to visit, expressing a great interest in the proposed congress and assuring me that their councils would act upon the matter immediately after their vacation.

#### Permissive Blocking in France.

According to the *Journal des Transports*, the St. Mandé accident of July 23, has resulted in a modification of the general rules for working the block system permissively. Heretofore a stationmaster has been authorized to allow a train to follow into a block section already occupied after an interval of time, but he has been required to notify the engineman that the section is occupied and that he should move with caution. The rule as revised requires that the stationmaster shall give the engineman a written order indicating the condition of the block section and the precautions necessary to be taken. This order is made on a blank form, and a stub retained in the order book will have the engineman's receipt and the number of his engine.





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#### EDITORIAL ANNOUNCEMENTS.

**Contributions.**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

**Advertisements.**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

An esteemed correspondent, who is a high officer of a railroad and has a good many years' experience in responsible positions in railroad operation, writes us: "You would do a good service by taking up some of the terrible accidents which have occurred lately, in which locomotive engineers have been killed through no fault of their own. The accidents to which I refer are those which have occurred so frequently of late through facing-point switches having been left open or incompletely closed. They have been left open by freight trainmen and the miscellaneous tramps employed by railroad superintendents, and they have not been properly protected by mechanical safeguards. The Brotherhood of Locomotive Engineers should take up this matter. The engineers are at the mercy of careless operators, brakemen and freight conductors, and are the victims of switches improperly locked and signaled. All of these accidents are the result of criminal carelessness." Our correspondent goes on to mention some of the accidents of the class referred to, and among others speaks of the derailment on the Chicago, Burlington & Quincy on the night of Oct. 21, near Monmouth, Ill., where a train ran into a facing-point switch which was not completely closed, and the train was split and derailed, several cars being overturned. Two men on the engine and two passengers were killed; 20 persons were injured. It is stated that this switch had been tampered with, but that explanation is seriously doubted.

Certainly our correspondent can not complain that we have not very frequently pointed out the comparatively slight expense with which facing-point switches could be protected by distant signals. There is some encouragement to be found in the spread, slow as it is, of the practice of connecting facing-point switches with distant signals at all points where trains are run at high speed. Our correspondent suggests that in addition to this such switches should have a detector bar and locking bolt, the bar and bolt to be thrown by the same lever which operates the switch, and the target, of course, would change position with the movement of the switch. All of this is very well and is in the line of improvement. At the same time the Brotherhood of Locomotive Engineers has another duty to perform than that of taking measures to see that only responsible trainmen and switch-tenders are employed and that facing-point switches are properly protected. It has happened to the writer of these lines twice within the last 18 months to be on a train when an engineman has deliberately run past distant semaphore signals protecting facing-point switches while those signals stood at danger. In each case the day was clear and the semaphores could have been seen for at least a mile. In one case, fortunately, no train was standing on the track which the engine entered in violation of the signal, but in the other case an ugly butting collision followed. One plain duty of the

Brotherhood is to help superintendents to maintain such discipline that such wilful and criminal carelessness on the part of enginemen should be impossible. On the contrary, it too often happens that if a man is discharged the Brotherhood at once brings pressure to bear through its committees to secure his reinstatement. It seems the obvious duty of the Brotherhood to pay attention first to the beam in its own eye; but certainly we should not discourage any effort made to compel railroad officers to properly protect their facing-point switches.

Another aspect of this whole subject is brought up by the statement that the C. B. & Q. disaster was caused by irresponsible persons tampering with the switch. Readers of the daily newspapers cannot have failed to notice the alarming increase of attempts, successful and unsuccessful, at train wrecking. It is true that reports of these occurrences are very often exaggerated; but actual cases, characterized by all the terrible possibilities, are really very frequent. Our readers will recall the Statesville (N. C.) disaster of Aug. 27 last, killing 18 persons; and the imprisonment for 10 years each of three wreckers, within a month past. This evil exists even in England with its elaborate police protection, sleepers having been placed on the track of the Great Western near Reading, Oct. 21, and near Croydon two days later. California papers have published exciting reports for the last week or two concerning the hunt for men who derailed a Central Pacific train near Colfax, Oct. 12, at one of the highest precipices on the road. Reports of malicious wrecking are constantly appearing in the press dispatches at the rate of about one or two a week. How the railroads and the public are to protect themselves against accidents of this class has always been a hard problem. It seems to get no easier with the spread of the tramp and other products of civilization. For the railroads the first and obvious step is to pursue every case of malicious wrecking to the end, and to spend money freely to catch and punish every wrecker. Our most conscientious officers do this, but we fear that in too many instances these offenses, like those of employes, are pursued with a zeal proportioned closely to the amount of damage done, so that if no great loss has been suffered, the criminal is not very hotly pursued. It is the duty, though, of railroad officers to make the crime terrible to evil doers and to teach small boys that it is a crime. In doing this the roads will convince those doubters who do not believe in malicious wrecking that it is a real and serious danger. It must be admitted that the statement that a switch has been maliciously misplaced or a rail loosened by tramps or robbers is always received by a good many people as an official lie to cover up "defects of road or equipment" or "negligence in operating." Every demonstration that an attempt has actually been made to wreck a train is thus worth a great deal to all the railroads of the country. It has a tremendous effect on public opinion. The first duty of the public in this matter is also obvious. It is for municipal, county and state officers to vigorously co-operate with the railroads in securing the arrest and punishment of trespassers on their premises. Whether or not beyond this it is necessary or even desirable to have additional legislation, with regard to the special crime of train wrecking, is another question. Generally speaking, it is probable that existing laws, if energetically administered, will be sufficient to secure the punishment of offenses of this sort. The difficulty seems to be to find and convict the offender.

An old and respected correspondent of the *Railroad Gazette* writes this week to controvert the views of Mr. Watson about the best way of getting good work out of freight train men. Mr. Watson believes in giving his crews every advantage in the way of co-operating with each other so as to do their work most easily and quickly, while our distinguished correspondent holds to the system, characterized more largely by machine methods, that has become so common since the enormous growth of freight traffic of the last 15 years. Mr. Watson, though a young superintendent, has adopted, to a greater or less extent, the old fashioned ways, which his critic says were "sleepy." It is not to be supposed, however, that he has adopted them without the advice and consent of older officers, and he can doubtless present some good arguments in favor of his view. The essential point at issue is the question of detecting misconduct in little things—the little things which, in the aggregate, go to make the difference between good and bad service. Our friend with the big name refers to the "sleepy days" when the men were so few that the superintendent knew them all personally:

and his contention seems to be that the sleepiness has been cured by giving up the idea of knowing the men and depending upon the perfection of the system to compel them to do their duty. A perfect system makes misconduct self-detecting. But everyone knows that absolute perfection is unattainable in this line, and we may now expect Mr. Watson to tell us what measures he takes to detect or prevent the innumerable well known tricks that railroad men of all grades will play when they have their own way. It is not impossible, of course, that by employing enough inspectors he can get along without the "self-detecting" features of the modern system. Moreover, we know from former letters of our eminent contributor that he too believes in having the division superintendent watch his men very closely, and it may be that he would employ both Mr. Watson's means and his own for keeping the men up to the proper standard. It will be in order now for both men to cite examples showing the efficacy of their respective plans. To equalize the efficiency of the individuals in a large force of men is to "level down" some of them, for it is impossible to "level up" the poorest men to the highest standard. Mr. Watson should now show that he does not let his shirks shirk, and Mr. Watt (without the son) must show that the friction of his machinery, due to imperfect fitting of parts, does not diminish the number of revolutions per minute of the "wheels of traffic."

In discussions of the compound locomotive and the economy that is claimed for it, the assertion is often made that the reason why it shows so great a saving over the simple engine is that it has been favored. It is usually attempted to show that the fireman and engineer are chosen for their skill, while the simple engine is left to the tender mercies of the turn about in the chain gang. We have before us, however, the record of one year's work on a road using twenty-four simple engines and four compounds of the Worsdell-Von Borries type, and which we regret that we are not permitted to publish in detail. This record shows that all of the simple engines carried 140 lbs. of steam, and the compounds 170 lbs. It shows, also, that on comparing the compounds which have cylinders 16 in. and 23½ in. × 24 in. with simples having 16 in. × 22 in. cylinders, with drivers of the same diameter, the compounds hauled on the average 21½ per cent. more cars, burned 13 per cent. less coal, and consumed 2½ per cent. more oil. Comparing again with simple engines of the same cylinder capacity as before, but with drivers 6 in. smaller in diameter, the compounds hauled 17½ per cent. more cars, burned 13½ per cent. less coal and consumed 8 per cent. more oil. Comparing the twenty-four simples with the four compounds, we find that the latter hauled 23½ per cent. more cars, burned 17 per cent. less coal, and consumed a trifle less than 14 per cent. more oil. So that for the same coal consumption the compounds would have hauled 38½ per cent. more cars than the simple engine with 16 in. × 22 in. cylinders and the same sized drivers. As we have already said, these data are taken from the records of a road for one year, where there has been no attempt to coddle the compound, and it has simply had credit for the work that it has actually performed in regular service.

The "Empire State Express" on the New York Central & Hudson River made its first regular trip last Monday. The regular schedule, condensed, and the actual run of Monday are as follows, the last two columns being the figures of the run:

	Time.	Miles from	Speed,	Time.	Speed,
	a. m.	New York.	miles per		miles per
	hour.		hour.		hour.
New York..	9:00	0	...	9:01:15	...
Albany.....	11:45	142.88	51.9	11:42:45	...
Utica.....	1:38	237.55	52.6	1:35:10	53.1
Syracuse..	2:45	290.72	52.6	2:43:30	50.3
Rochester..	4:14	371.10	54.3	4:10:57	...
Buffalo....	5:40	430.52	48.9	5:43	53.4
New York to Buffalo	...	...	52.2	...	...

The loss of time between Albany and Syracuse is attributed to an inferior quality of coal which had been put on the tender by mistake. With regard to the effort to make up time after leaving Syracuse, the *New York Tribune* says, "Now began a race to recover the loss. 'Charley' Hogan stood peering ahead with every nerve, noting the vibration of that flying machine. Faster and faster the cars are hurled along the tracks, which now look like twining serpents. Charley's peering nerves seem to have been of little use between Syracuse and Rochester, as the loss of time was increased in that part of the run; but from Rochester to Buffalo, 68 miles, he hurled his flying machine over the twining serpents so fast that he made up seven minutes on a 49-mile schedule. The train on this run was made



up of five cars weighing about 178 tons and the engine weighed about 100 tons more. The fastest time is said to have been about 70 miles an hour. The regular schedule calls for 59.61 miles in one hour, from Memphis to Fairport. The sum of the grades from New York to Buffalo is as follows:

	Number of grades.	Total ascent.	Miles of up grade.
Ascending.....	184	1,855 ft.	144.49
		Total descent.	Miles of down grade.
Descending.....	159	1,318 ft.	101.43

An order has been issued by Mr. G. B. Hazlehurst, General Superintendent of Motive Power of the Baltimore & Ohio, to oil centre plates of all freight cars. Those who are familiar with the construction of the Baltimore & Ohio centre plate know that the design is one which will retain oil after it is put between the surfaces. The ordinary form of centre plate is such that oil will shortly work out and be wasted. At inspection points on the Baltimore & Ohio the men are provided with long oil squirt guns with which they can reach from the outside of the car to the centre plate. The advantages of oiling these plates are not as fully appreciated as they should be. If the side bearings do not touch, the saving in flange wear of the wheels resulting from oiling the centre plates will more than pay for the cost of oiling. This is more particularly true where the centre plates are made large to prevent the cars from tilting too much. It is only within a short time that there has been a general appreciation of the necessity of keeping the cars off the side bearings in order to reduce the flange wear of the wheels. Now it is common to see on all refrigerator and special freight cars the side bearings separated about three-eighths of an inch and greased with a heavy grease. We cannot learn of any statistics showing how much this has decreased the wear of wheel flanges, but we hear frequent good reports from those who have watched the action of cars so lubricated. The pressure per square inch between the surfaces of centre plates varies from 800 to 3,000 lbs., and there is often a decided tendency to cut and wear with an accompanying frictional resistance to turning which has to be resisted by the wheel flanges. It is not uncommon to see on coal roads on the tangent just beyond a curve, where overloaded coal cars pass, a marked wearing of the rail on the tangent where the trucks are straightened out in line with the car after leaving the curve. The cause of this wear is the immense resistance to turning, which results from the cars resting heavily on their side bearings. If such wearing of the rail results there must also be a considerable wearing of the wheel flanges. On some narrow gauge lines of the Union Pacific, where sharp curves are numerous, it has been customary to grease the centre bearings and side bearings to decrease the resistance of the train. Undoubtedly, there are some lines so straight that it would be of hardly any advantage to oil the centre bearings, but the side bearings should always be oiled if they are touching on both sides. There are several designs of roller side bearings and centre plates now on the market, the object of which is to reduce the turning resistance of the trucks, and decrease the flange wear and the train resistance. This order on the B. & O. for oiling all centre plates is an important one, and if accompanied by a careful inspection of the conditions of the side bearings there will undoubtedly result a saving in fuel burned in the locomotives, and in wheel wear, which will many times pay for the cost of inspection and oil.

#### Ventilation of Tunnel Railroads.

A writer in the New York Times of Oct. 16, in speaking of the ventilation of a rapid transit tunnel, says of the City & South London Subway: "The road is well ventilated. It could not well be otherwise. Each train of cars acts like a piston in a cylinder. It pushes ahead a volume of air and another comes from behind to take the place of that ejected." It is evident that those who talk in this way, and they are numerous both among laymen and engineers, have very little idea of the difficulties which surround the purification of air vitiated by a large number of people in an inclosed space inside of another inclosed space. We are not in the habit of considering the average railroad car in this country as a specially well ventilated place, but a little examination will show that it has opportunities for being so of rather exceptional character.

In the first place at the time of the year when windows are closed, the air is heated by the people in it and generally by stoves or steam pipes in addition. It consequently rises with some rapidity into the monitor top, which effected, 30 years or more ago, such a radical improvement in car ventilation. There it finds an

exit by the openings provided, which, though generally inadequately opened for very good ventilation, are fairly effective.

This action is powerfully supplemented by the educative effect of the air current rushing past the ventilating openings. In fact, that this is the largest element in the withdrawal of the foul air of the car, especially when the openings have the excellent Creamer ventilator, must be tolerably clear to every one who has observed the quality of the air of a car when standing at a terminal station for some time, as compared with the air of the same car when in motion. Even with one or both doors open, the air in the stationary car is apt to deteriorate much faster than when *en route*.

Fresh air enters when the train is in motion from the unlimited reservoir of fresh air through which the train is rushing, by the numerous cracks of doors and windows, and sometimes by judiciously opened sashes in the doors at the ends, or by end ventilators opening under the platform hoods.

The inadequacy of all these appliances is supplemented, particularly in city trains, by the opening of the doors in stopping. Most people have noticed what a current is set up in the car by the inertia of the air in it as the train is coming to a stand after the doors are opened. This is sufficient in itself to change one-fifth to one-fourth of the air in a car open at both ends at each stop. The efficiency of this action as a ventilator is very noticeable in the difference between the ordinary winter condition of the middle cars of New York elevated trains as compared with those at the ends where one door is kept constantly shut. The air of the end cars is in many cases too offensive for a delicate nose to bear when that of the middle cars is very fair. In the New York Rapid Transit Commission's scheme it has been generally proposed, even by the consulting engineers, to vestibule the train and use side entrances only, cutting off much of this means of ventilation.

So much for change of air within the cars. Outside the train on the surface roads the vitiated air discharged from the cars is carried off into the boundless reservoir around, where the air is changed with such velocity by a five-mile breeze only, that even in a crowded city like New York there is hardly an appreciable difference in the carbonic acid contained in the air from that in the air of an Adirondack mountain top. It is true that the air taken in is more or less loaded with dust and with smoke and gases from the locomotive; but at the worst it is not charged with the exhalations from human lungs and skins.

How will it be under the piston action, which is to insure perfect ventilation? The train will, of course, not move the air solidly ahead of it. If it did it is obvious that there would be practically no ventilation of the car, the air in it, good or bad, being bottled up between good air front and rear. It is the air which escapes past the train or through it which must be relied upon to carry off the foul and supply fresh air. The foul air then escapes into the next division of the tunnel, and is mixed with the nominal fresh air supplied to the next train. This polluting action would be cumulative, except so far as a limited quantity of air would escape at stations; and that would be only a limited quantity, since it is easier for the air to follow on behind a train ahead than to fight its way up a shaft against fresh air drawn down by the suction of the train.

But, it may be said, it is proposed in New York to use fans. "H. L.," in the passage quoted from the Times, was writing about a tunnel with "piston" ventilation only, but let us see how the fans will act. The fan can be used in one of two ways in a single track tunnel. It can draw the air with the cars or it can force it, with considerable difficulty in the appliances, against the direction of the train. In the first case, supposing it clears the air at the rate the train moves. Without considering the impracticability of exhausting the air from the whole tunnel section at say 30 miles an hour, what should we gain by so doing? It is true that the train, if the air were taken out between each pair of trains, could be made to move in pure air, but what escape from the cars would there be for the foul air and what cause for entrance for the fresh into the cars? We should simply have the piston ventilated condition above referred to.

Let us try a less velocity, say 10 miles per hour. The train motion would then produce two-thirds the ventilating effect that it would in forcing its way through still air, but, on the other hand, it would leave the air vitiated behind it, and ventilation stations must be less than one-third of the train headway apart to prevent at least one train passing through the vitiated air of a previous train, part of the time, even on the supposition that the foul air behind the train would not mix with the fresh air coming to take its place.

The above action is only true, furthermore, of trains moving at a uniform speed. In the case of trains making stops one-quarter mile apart, we should have the following process: The train on leaving the station would have the air from the cars drawn ahead of it until a 10-mile speed was reached. It would then begin to pass through its own vitiated air, continuing in the same, until this air was overtaken. So far as the ventilating effect on the train is concerned there must then be a period, approximating half the running time, when the car ventilation would be null. On the other hand this same action would, of course, tend to keep the foul air of any train further away from the following one than where a uniform speed is maintained. As then the velocity of the ventilation current in the tunnel decreases, the ventilating effect on the cars will be increased, but the quality of the air supplied to trains following will be made worse and *vice versa*. We are then somewhat between the devil and the deep sea in this form of ventilation, and it is obviously far from giving as effective a ventilation to the cars as the simple passage of a train through the air above ground.

In regard to ventilation in the reverse direction to the train movement it will be evident that while the ventilating effect on the cars would be admirable the system is surrounded with difficulties. In the first place the air current through the tunnel would be obtained with great loss of power, both in forcing the air past the advancing train and in the obstruction offered to the train movement; apart from the difficulty of introducing a current into the tunnel against the traffic. It is safe to say that a velocity against the train of more than four or five miles per hour would not be practicable, by reason of the great expenditure of power involved. Now five miles per hour, if the ventilating fans were one-quarter of a mile apart, would only change the air 20 times per hour or once during the passage of three trains. The purifying effect would be much less than this, since there would be a constant forcing of the foul air ahead of the train, splitting the oncoming current of fresh air, which would pass around the cars on all sides; and delaying the mixing action upon which the above 20 changes in the hour depend. Taken altogether the reverse current does not seem so desirable a method as the other, since, while more effective in changing the car air, it would supply poorer air to the cars and would be enormously extravagant of power.

Summing it up, it appears for single track tunnels:

(1) That the simple passage of the train through the tunnel and its piston ventilating effect is not to be relied upon because it will have no effect in changing the air of the tunnel, which must become cumulatively worse, except so far as modified by the passage of the warm tunnel air up the shafts and by the flow of cold air down the same to take its place, an action entirely inadequate to afford good ventilation of the tunnel itself, to say nothing of the cars within it; and which would obtain only in the cold months.

(2) That the ventilation by a current of air moving with the trains, if anywhere near adequate to keeping the tunnel air similar to the air above ground, leads to much difficulty in securing a change of air in the cars themselves.

(3) That the ventilation by a current against the train direction, while lending itself admirably to change of car air, would be inadequate to maintain a good quality of air in the tunnel, and would be very extravagant of power.

When double or quadruple track tunnels are to be ventilated the problem becomes exceedingly complicated, owing to the stagnating or eddying effect produced upon a ventilating current moving in a given direction by a train moving the other way. The result would undoubtedly be injurious to the general condition of the tunnel air, since it would, at times, hold back blocks of vitiated air, letting fresh air introduced pass directly through without effect.

Considering all these facts, it would seem that good ventilation of a city railroad tunnel would require the use of separate tunnels for each direction of traffic and of suction fans of great power placed just short of the stations in the direction of the traffic, with downcast shafts just beyond the stations in the same direction. This arrangement would make each station shaft or entrance consist of an upcast ventilation shaft on one side and a downcast on the other, with stairs or elevators between them. The object of this arrangement would be to avoid furious draughts in the station wells and on the platforms. Supplementary to this, artificial ventilation in the cars themselves would be needed to keep up a circulation of air in them, particularly if the vestibule-side entrance plan of train were adopted. The importance of this last feature will probably be conceded by anyone who has traveled on the London



underground and noticed how curiously the bad air sticks to the cars. The air on the station platform is not "half nasty," as an Englishman might say, but as soon as one enters the carriage, even when it is one of the open-end-to-end variety, the stifling quality of the air is at once noticeable. It is something quite different from the hot odorous quality of our cars above ground. In that case it is probably largely due to carbonic acid from the engines used, but its continued badness, even at the end of a station stop, with all the doors open, shows how slowly it changes.

The fact is that thorough ventilation of a tunnel railroad to make it a competitor with a road above ground, while not beyond the limit of man's ingenuity will undoubtedly be very expensive, and to work at all well will have to be studied out by the best expert talent. It certainly cannot be dismissed in the airy manner of "H. L."

Of the other two great problems of the underground scheme, darkness and noise, the former will be considered by most people solved, at considerable expense however, by the use of electric light, though it is doubtful how popular constant travel by this light will be when daylight routes are available. The noise of a tunnel is inextinguishable by any means now known, whatever the ingenuity of man may do with it in the future.

#### The Dakota Elevator Law.

The legislature of South Dakota passed a law for the regulation and government of the business of storing, handling and carrying grain, and in August last the Railroad Commissioners adopted a set of rules and regulations for the execution of the law. The rules are 68 in number and fill 21 octavo pages of print. They were well designed to obstruct business, but fortunately have so far proved inoperative. A few weeks ago, however, the possible effect of the law alarmed many carriers, elevator men, millers and dealers and a synopsis of the law and of the rules of the Commissioners is still interesting.

Minnesota, being a comparatively old state, had established laws governing the handling and inspection of grain, and the grades established under them have been accepted in the markets of the world. Grain from Minnesota and other states, marketed in that state, was graded under the laws so established; as the greater portion of the wheat and other grain produced in North Dakota and other states beyond Minnesota found a market in that state, it took the Minnesota grades unless sold by sample. Whatever cause for dissatisfaction there was need not be discussed here, but political influences had their weight. The outcome was that the new state of North Dakota enacted a law for the government and regulation of the grain business.

The law makes it the duty of the Railroad Commissioners to supervise the handling, weighing and storage of grain and seeds, and to establish all necessary rules and regulations for weighing grain and for the management of the public warehouses of the state, so far as such rules and regulations may be necessary to enforce the provisions of the law of the state. The act further provides that all buildings, elevators or warehouses in the state erected and operated by any person, association, copartnership, corporation or trust, for the purpose of buying, selling, storing, shipping or handling grain for profit are declared public warehouses. Having thus declared what should be deemed public warehouses, the law makes provisions and gives the Railroad Commissioners power to make regulations concerning the conduct of the business of the warehouses or elevators. The law fixes the rate for receiving, elevating, insuring, delivering and twenty days' storage at two cents per bushel; after twenty days one-half cent for each fifteen days or fraction, but the charges shall not exceed five cents for six months.

The Railroad Commissioners, having authority in the premises, published rules and regulations for the inspection of grain and the government of public warehouses, the claim being that all warehouses are public under the definition of section four as above.

The elevator owners objected to rule six, which provides that they shall inspect, grade and weigh the grain received or purchased, and notify the party offering it of the grade and weight and of its market price on that day in Minneapolis or Duluth. They also objected to the rate fixed as above and especially to rule 18, which is: "Each elevator company operating in this state shall furnish to the Commissioner of Railroads a daily report of the prices to be paid each day at every elevator operated by them, which price shall be based upon the Minneapolis price at which the wheat purchased can be sold and delivered the day before, deducting freight from the station to Minneapolis, and not to exceed four cents (and fractions) per bushel for all cost for handling the same."

In short, the elevator people claimed that elevators were used only for storing grain purchased by them, were not public elevators, and the legislature could not, by its enactments, make that a public business and subject to regulation, which was in itself private. In other words, most of the elevators declined to receive grain for storage for hire, *i. e.*, for the public.

A proceeding was instituted by mandamus to compel an elevator to receive and store grain. The district judge who heard the case decided that the law was of no force so far as it provided that private elevators should be deemed public and subject to regulation and that elevators not in fact doing business for the public were not subject to the provisions or rules of the Commissioners. In another case the elevator company admitted that it was being operated as a public elevator and it refused to receive and store grain for the public at the rates fixed in the law and by the Commissioners, claiming that the legislature had no right to name a rate, and that the doctrine of the Munn case did not apply, for the reason that the elevators in question were smaller and that they had and could exercise no monopoly, not being located so as to be an essential instrumentality of public convenience, as was the case of the Munn elevator, which was located at a point where its use was essential and convenient and where, from the nature of its location, there was and could be no competition. The court overruled this contention, holding that the legislature had a right to fix what should be deemed, in the first instance, a reasonable rate; that the rate fixed was not conclusive, but must be considered reasonable until the elevator people satisfied the court that it was unreasonable.

Rules from 20 to 25, also rules 36 and 37, provide for the inspection of grain in cars in transit from the state, also make provisions for the methods to be pursued in doing so. Inspectors and deputy inspectors were appointed and instructed to make inspection of wheat in cars under these rules. Such inspection would necessarily occasion a delay in the movement of trains of from one to two or three hours, and also require the holding of trains arriving in the evening until the next morning, as inspection cannot be conducted by artificial light.

Actions were commenced in the Circuit Court of the United States, District of North Dakota, by the Great Northern and the Northern Pacific against the Railroad Commissioners and inspectors to enjoin them from interfering with cars and trains and making inspection under such rules. The railroad companies claimed that such inspection of wheat consigned to points without the state and the stopping of trains containing cars *en route* through the state, from Montana and other States in the far West, was an interference with interstate commerce, and that inspection could only be considered for the purpose of preparing property for commerce and not while it was in transit from the state, after it had been sold and the title had passed to a non-resident; or after it had become an article of commerce. They also claimed that such inspection was not for the purpose of preventing adulteration or fraud, or on any ground of health, but that it was justified and necessary only as facilitating the handling and transportation of grain. Grain of different parties must be mixed in cars and in elevators. The purpose of inspection is to preserve the rights of shippers or owners, and to guard against the mingling of grain of low grade with grain of better quality. The railroad companies also claimed that such inspection was not authorized under the provisions of the law of North Dakota.

The court, on hearing, decided that such inspection was not required or authorized by the law of the state. It did not become necessary to pass upon the other ground; that is, the question as to interference with interstate commerce.

Nearly all of the elevators are now running as private ones, and without regard to the regulations imposed by the law or the Commission upon public elevators. Final judgment has been entered in favor of the railroad companies in the actions brought. No further proceedings have been had, or attempted, to enforce the inspection of grain in cars.

#### Annual Reports.

**Chesapeake & Ohio.**—The Chesapeake & Ohio reports for the year ending June 30, 1891. The main line mileage operated was 897.5 and branches 36.4 miles, against 931 miles the year before; but there were 1027.4 miles in operation June 30, 1891, 95.9 miles having been added during the year. The earnings and expenses were:

	1890.	1891.
<b>Earnings:</b>		
Passengers.....	\$1,471,436.56	\$1,765,238.81
Freight.....	5,384,255.70	5,984,516.03
Miscellaneous.....	66,023.63	187,241.36
Express.....	89,197.65	90,487.71
Mail.....	108,971.57	120,567.18
Newport News and Norfolk Terminal.....	9,064.26	
	\$7,161,949.37	\$8,127,111.09
<b>Expenses:</b>		
Maintenance of way and structure.....	\$1,574,686.89	\$1,422,889.14
Equipment.....	1,093,827.58	1,212,250.63
Conducting transportation.....	2,296,080.77	2,436,212.53
General expenses.....	184,369.58	169,951.61
Traffic expenses.....	188,287.61	191,427.58
Newport News and Norfolk Terminal.....	76,047.92	342,087.25
Covington and Cincinnati Bridge.....	111,886.95	138,549.16
	\$5,455,127.30	\$5,920,418.20
Net earnings.....	\$1,706,822.07	\$2,206,692.89

\* In 1890 the accounts of the Newport News and Norfolk Terminal were kept separately, and only the monthly balances appeared in C. & O. accounts. In 1891 the gross earnings are included in C. & O. earnings and the gross expenses appear.

† In 1890 the accounts of the Covington and Cincinnati Bridge were kept separately, the monthly balances of earnings appearing in C. & O. accounts, and balances of expenses being charged therein. In 1891 the gross earnings of the bridge are included in C. & O. figures, and total expenses are charged therein.

The earnings per mile were:

	1891.	1890.	1889.
Gross earnings.....	\$8,660	\$7,759	\$6,808
Operating expenses.....	6,312	5,910	5,480
Net earnings.....	\$2,348	\$1,849	\$1,318

A few figures of the volume of traffic and receipts per unit are as follows:

	1891.	1890.
Passengers.....	1,692,072	1,470,642
Pass. miles.....	81,908,154	71,567,114
Ton freight.....	4,166,102	3,760,577
Ton-miles.....	1,135,943,311	1,006,323,855
Rate per pass.-mile, cents.....	2.155	2.056
Rate per ton-mile, cents.....	0.525	0.535
Average freight train load, tons.....	263	295
Average haul, miles.....	273	267

The coal rate was very low, having been 0.328 cent to the seaboard and 0.48 elsewhere. For other freight the rate per ton-mile was 0.655 in 1891 and 0.628 the preceding year. It is especially noticeable that the volume of freight business has increased and that the rate excluding coal has also increased. Passenger business has also increased both in volume and in rates. The coal rate, however, is extraordinarily low. The President expresses the hope that when competing lines get tired of advertising themselves by taking seaboard coal at unnecessarily low rates the rate will improve; meanwhile this business is not worth pushing.

But the chief interest of the reports of this company now is not in present rates and earnings but in the unremitting and intelligent preparations for the future. These are seen in the acquisition and construction of branches, the improvement of terminals, the establishment of important steamship connections and the heavy outlays for betterments of road and equipment. Ever since the reorganization this process has been going on. In 1889 control of the Richmond & Allegheny was secured, making a low grade line to foot of the eastern slope of the Allegheny mountains. Since then branches have been acquired or built into coal, mineral and timber lands; besides, the Warm Springs Valley branch to the hot springs which will doubtless give a valuable passenger business. Within the last year a contract has been made for steamer service to Europe, the sailings to be increased in frequency as the business demands. At present they are semi-monthly. Favorable relations have been established and maintained also with steamer lines to New York, Providence and Boston. Since last March the company runs its own trains into Washington, having secured favorable trackage rights.

The heavy expenditures on track and equipment may be seen from the maintenance items in the operating expenses. In 1891 maintenance of way and structures was charged at the rate of \$1,530 a mile, and maintenance of equipment at nearly \$1,300 a mile. These two items alone made up 45 per cent. of the operating expenses. The stockholders are encouraged, however, to think that the extraordinary betterments can be steadily reduced, and that the company will, before long, be able to consider paying moderate dividends on its first preferred stock. But they are warned that much must be done in the next few years in filling trestles, ballasting, sidings, arching tunnels and improving terminal facilities in Richmond and Lynchburg.

The November issue of *Scribner's Magazine* contains a paper by M. Napoléon Ney entitled the "Proposed Trans-Saharan Railway." A synopsis of the history of explorations by the French for a railroad from the Mediterranean coast southward toward the Niger and Lake Tchad is given. This is the picturesque part of the narrative. Then follows an account of some of the work that has been done by the French in irrigation by means of artesian wells at various places in the desert the result of which has been the development of a considerable and apparently reliable agriculture. Upon the possibilities of such development the success of a railroad across the Sahara depends to a very great degree; therefore the little that is told of the work in this article is of peculiar interest. It does not, however, seem to be a very satisfactory basis for such a tremendous undertaking as a railroad across the desert will be. The estimated length of railroad from the Mediterranean to the bend of the Niger is from 1,615 to 1,739 miles. From the Mediterranean to Lake Tchad is from 2,100 to 2,230 miles. M. Ney estimates that the railroad can be built to metre gauge with rails of 40 lbs. per yard, at a cost of 100,000 francs per kilometre, or, in round numbers, 400 million francs, about the cost of the Suez Canal. He estimates gross earnings from the local trade of 2,000 francs per kilometre, from export and import trade 7,310 francs, and from passenger traffic enough to bring the total earnings up to 10,000 francs per kilometre. The operating expenses for one train a day in each direction are put down as between 5,000 and 5,500 francs per kilometre per year, leaving a prospect of net earnings of 4,500 to 5,000 francs per kilometre, which would pay a very fair interest. M. Ney does not enter into any specific details as to how a railroad with one train a day each way is going to make gross earnings of \$3,200 a mile. He does, however, express the hope that a great colonial company will undertake to build and operate this road in return for the charter and the rights covering the country affected. We should be very reluctant to believe that such an enterprise is likely to be undertaken at present. The French people have had an example of unremunerative investment that ought to last them for a good many years, and it is desirable that the whole civilized world should take



The first topic touched upon was the rating of motors. Thus far it has been common to speak of a machine as a 15



H. P. or 20 H. P. motor, with scarcely any further suggestion of conditions under which it is supposed to operate. It must be borne in mind that an electrical motor, like any other machine, a man, for instance, is capable of performing work at widely varying rates and widely varying efficiencies, and with widely varying factors of safety with respect to indefinite continuance of such a rate of work. It should further be borne in mind that an electric motor in particular is known to do its maximum rate of work when its efficiency is only 50 per cent.; that is, if 20 H. P. represents the maximum rate of work, then 40 electric H. P. will be required to perform this work. A series motor such as is commonly used for railroad work, also must vary very widely in its speed while varying the quantity of work it performs per second.

In order to establish a basis for the proper rating it would not be far out of the way to assume 10 miles per hour as the speed of the cars. If, then, we state concerning a motor that it can develop so much horizontal effort at that speed, we at once have a pretty close approximation as to what load of car and passengers it can handle at that speed, since we know that 25 lbs. per ton is a fair approximation to the average traction coefficient. Suppose, then, we are told that a motor can produce a horizontal effort of 500 lbs. at 10 miles an hour; it is then a quick inference that a car weighing 20 tons can be carried by such a motor at the rate of 10 miles per hour on a level. We may then conveniently call this motor a "500 x 10."

If we further desire to get an approximate idea of what it will cost to do this work with a particular motor, we should know something of its efficiency. This can be conveniently expressed by adding another dimension. Thus, say the motor is "500 x 10 x 60." The "60" indicates the efficiency percentage with which electrical energy from the line is transmitted into mechanical energy, and horizontal effort applied to the car.

This would be on the supposition that a standard 30-in. wheel is used; but the figures could be easily varied to correspond to the work done with a 33-in. wheel. It is also assumed in this rating that the machine is working under a pressure of 450 volts. This method would do away with the variations in rating now common among different manufacturers due to their honest differences of opinion as to the basis upon which to rest their statements.

The Convention wound up after the selection of John G. Holmes, of Pittsburgh, as President, and Cleveland as the next place of meeting.

A notable part of the Convention was the large display of supplies and apparatus. It not only occupied the Monongahela House and the streets adjoining, but filled a large river barge, a float and part of a steamboat, the three craft being moored at the foot of the Hotel Hill.

The leading mechanical exhibits were trucks, wheels and rails for all classes of work, the Johnson Co. being very well represented. The Walker Manufacturing Co. of Cleveland showed a photograph of one of the big cable driving drums for the Third Avenue Road, New York. The drum is 32 ft. in diameter, face 6 ft. 1 in., has 22 grooves for 2½ in. rope, and weighs 75 tons. The Burton and Carpenter Companies showed some very ingenious devices for heating cars electrically. The Burton heater is now in use on 60 street roads, and is being rapidly introduced. The bare wires are embedded in asbestos and fire clay, and the many pointed iron shell radiates the heat quite effectively. In the Carpenter heater the wire is placed on the iron between two coatings of glaze similar to that on "Puritan" ware.

Perhaps the most interesting exhibits of all were the "gearless" motor cars exhibited by the Westinghouse and the Short companies. A brief year ago all the manufacturing companies were supplying "double reduction" motors, or those in which the speed of the armature was geared two steps down. Then came the "single reduction," with only one gear, and this is giving excellent results, both the Thomson-Houston and Edison companies adhering to it. But the other two concerns named have pushed on boldly and now are introducing "gearless" motors, which are just what their name implies. To put it plainly, the speed of the armature is the speed of the car wheels. In the Short motor the armature is simply sleeved on the car axle. A three armed spider is placed upon each end of the hollow shaft. Each arm is provided at the extremity with a socket to receive a rubber cushion or spring. These cushions bear upon lugs cast on the car wheels, and as the armature shaft and spider revolve the action is imparted to the car wheels. But the Westinghouse motor "goes this one better," for the armature in it is mounted directly on the car axle itself, and so dispenses with even the devices just mentioned. It may be said that both types of car operate very noiselessly, and so far as tests go at present, with as little consumption of current as in the case of the "single reduction." Not only do they get rid of the noise of the gear and its wear, but they reduce the amount of mechanism to be looked after under the car, and bring electric railroad practice one step nearer that of the steam locomotive.

#### TECHNICAL.

##### Manufacturing and Business.

The Robb Engineering Co., Amherst, N. S., is applying for incorporation, with a capital stock of \$249,000, for the purpose of enlarging the business heretofore conducted by A. Robb & Son in iron and brass founding and general engineering and the manufacture of all kinds of machinery, engines, boilers, etc.

The corporation of Winnipeg, Man., are calling for tenders from firms desiring to construct, own and operate a system of electric street railroads in the city. Propositions addressed to D. Smith, chairman of committees, will be received up to Nov. 12.

The corporation of the city of Winnipeg, Man., are advertising for tenders for the supply of 18,000 ft. of vitrified sewer pipe, ranging from 9 in. to 12 in. in diameter. Tenders will be received up to Nov. 12.

The National Car Heating Co., 436 Rookery Building, Chicago, will be represented by Mr. R. H. C. Searle, a brother of the inventor of the system of car heating controlled by that company.

The Eureka Coupler & Buffer Co. has purchased the entire interest of Mr. E. P. Caldwell in the Eureka coupler, and there has been a reorganization of the officers, as follows: President, George McMichael; Vice-president, A. C. Paul; Secretary and Treasurer, C. Wright Davison.

The Milwaukee Car Wheel & Foundry Co., of Milwaukee, Wis., has decided to remove to St. Paul, Minn. Negotiations have been pending for some time with St. Paul parties, who have offered assistance to the company in case they would establish a foundry in that city. It is understood that a site with suitable railroad trackage has been secured, and that the work of erecting the buildings will be commenced soon. The company will continue to manufacture car wheels, using the Barr contracting chills. In addition to car wheels several specialties will be manufactured, as well as malleable and other castings.

The Keuffel & Esser Co. has opened a branch house at 265 State Street, Chicago, for a wholesale and retail business as manufacturers of drawing materials, surveying instruments, etc. The firm will be represented there by Mr. F. Braasch and Mr. F. M. Blanchard. It is the intention to carry a full stock of goods in Chicago.

The Engineering Equipment Co., of 143 Liberty street, New York, and 126 Pearl street, Boston, had on exhibition at the Pittsburgh convention of the Street Railway Association a handsome model of the Boston trolley, which well illustrated the operation of the trolley on the top of the car; a full size wheel and harp; samples of the Anderson line and materials and circulars relating to the company's specialties in belting and electric railroad materials, Habirshaw wires and cables, etc. W. F. D. Crane was in charge.

Thos. L. Johnson has been appointed the Western Agent of H. W. Johns Mfg. Co., of New York, and will be the representative for the railroad business of the firm.

Messrs. Watson & Stillman, of New York, have recently added 5,000 ft. to their large hydraulic machinery works. The new addition will increase the production of railroad tools. The output of hydraulic jacks and car wheel presses has increased to such an extent, especially in the last two years, that the capacity of the old works was overtaxed, and orders could not always be filled promptly.

The Gould Coupler Co. has bought the Cowell platform and buffer and the right to manufacture and sell the Cowell passenger coupler from the Cowell Platform & Coupling Co. The platform and buffer will hereafter be known as the "Gould continuous platform and buffer," and will be the same as applied by the Wagner Car Co. to its vestibule cars. This platform, with the Gould passenger car coupler (M. C. B. type) will place the Gould Coupler Co. in position to give the railroad companies a good equipment for passenger cars.

##### Iron and Steel.

The Lunenburg Iron Co., of Lunenburg, N. S., has been organized with a capital of \$10,000 for the purpose of manufacturing iron and other metals.

A number of capitalists of New Brunswick and Nova Scotia are forming a company to build a charcoal iron blast furnace on the Grant farm about 12 miles from New Glasgow. A large deposit of high iron ore, with belts of limestone running through it, has been opened up, and forests of hardwoods in close vicinity have been purchased from which the charcoal will be made.

The American Bridge & Iron Co. at Roanoke, Va., has recently added much new machinery to its blacksmith shop, and is putting in a boring mill and a large crane.

The Cleveland, Cincinnati, Chicago & St. Louis has put in Greenlee's automatic hollow chisel mortiser in all the shops on its system.

An iron boiler house for the Oswego Pulp & Paper Co., at Fulton, N. Y., has been designed by the Berlin Iron Bridge Co., of East Berlin, Conn.

##### The Rail Market.

Steel Rails.—Sales of about 25,000 tons have been reported in the last week, of which 20,000 tons were taken by an Eastern mill. A number of roads are in the market, and the outlook for business for the winter months is considered favorable. The quotations are: In the East, \$30; at Chicago, \$31.50@33; and at Pittsburgh, \$30 at mill.

Old Rails.—Old iron rails are quoted nominally in the East at \$20@21, and old steel rails are \$16@17. At Pittsburgh old iron rails sell at \$23.50@24, and steel at \$17@17.50.

##### New Shops.

The Silver Springs, Ocala & Gulf will build machine shops at Dunnellon, Fla.

An engine house at Mott Haven, N. Y., with 12 stalls, for the New York Central, has been nearly completed.

Plans have been filed by the Baltimore & Ohio Railroad for an iron freight shed and office to be erected on new Pier 14, North River, in New York City, 75 x 718 ft. in size at a cost of \$63,000.

##### Car Heating.

Mr. Payson Tucker, the General Manager of the Maine Central, issues an order, extracts from which follow, under date of Oct. 1. Its chief significance is in that it warns conductors and trainmen of the necessity for attention to the steam heating apparatus and makes them understand that they will be held to strict accountability for failures:

Conductors are expected to see that the trainmen under their charge fully understand the workings of the Sewall System of steam heating in order to obtain the best results with the least expenditure of steam. When cars are set off or left for the night in freezing weather, it is imperatively necessary that all valves both outside and inside of the cars be left open to drain off the condensation, otherwise the pipes are liable to burst by freezing. When a car is found frozen up it shows neglect on the part of trainmen or the person whose duty it was to attend to the valves, and such cases in future will be investigated and the responsibility fixed. All employees whose duty requires them to have anything to do with steam heating of cars are expected to make themselves perfectly familiar with the system and to use their utmost endeavors to take proper care of the same.

##### Car Lighting.

Arrangements are making to build Pintsch gas plants at Buffalo, Cleveland and Toledo. These new plants, together with those at Chicago, Minneapolis, St. Louis, Cincinnati, Syracuse, New York and Boston, will provide

very completely for the whole Vanderbilt system, and apparently there now remains no obstacle to the rapid equipment of all the cars of those lines for Pintsch lighting.

##### Car Couplers.

The Chicago coupler has been adopted as the standard for the entire Chicago & Northwestern system. This coupler is applied to all new cars and to all cars passing through the shops for repairs. The roads included are the Chicago & Northwestern; Chicago, St. Paul, Minneapolis & Omaha; Fremont, Elkhorn & Missouri Valley, and Sioux City & Pacific.

##### A Steel Tube Tunnel.

Mr. R. Powell last week laid before the Board of Control of the City of Cleveland, O., a plan for constructing the new water-works tunnel in that city of tubes made of steel plates. He proposes a tunnel 8½ ft. in diameter, built of ½ in. plates. He would build it in sections 300 or 400 ft. long. These when completed would be towed into the break water basin and joined in sections 1000 ft. long. These latter would then be towed into position on the line of the tunnel, joined together and sunk. He has submitted plans for bulkheading these tubes and also for admitting water to sink them.

##### New Steel Ships for the Richelieu & Ontario Navigation Co.

The Richelieu & Ontario Navigation Co. will build two steel steamers this winter for service between Kingston and Montreal. Estimates for the construction of the boats will be received from shipbuilders in New York, Baltimore, Cleveland and Toronto. The steamers will be built at a large expense and handsomely equipped. The new boats will run in connection with the railroads, and will not interfere with the work of the regular line boats.

##### National Legislation on Safety Appliances.

We have been requested to state that the hearing to be held in New York City, Nov. 10, by the committee on the above subject, appointed at the National Conference of State Railroad Commissioners at Washington, will be confined, so far as the question of car couplers is concerned, to hearing representatives of railroads and railroad employees. The time of the committee is too limited for it to enter into any consideration of the merits of the numerous patterns of couplers that have not come into extensive use.

##### Demurrage in Texas.

The railroad commissioners of Texas have already found that their \$2 demurrage rule would not work to suit any body, and they have issued a revised circular to go into effect Nov. 2, making the rate per car per day \$1 after 48 hours, and up to the close of the fifth day after the expiration of the 48 hours; thereafter \$3 per day must be charged. The order says that the railroads must promptly send to consignees a written notice, either by messenger or mail, on the arrival of bulk freight. Where a road unloads freight which remains on hand after proper notice \$1 per car shall be charged for unloading.

##### A Chicago Tunnel.

A committee of property owners who have taken up the question of connecting the north and south boulevard systems of Chicago either by a bridge or a tunnel are at present inclining favorably toward what is known as the May Tunnel, devised by Mrs. H. N. May, which provides for a subway 3,200 ft. long, and they have appointed a sub-committee with instructions to prepare plans and estimates of this tunnel. The committee have power to employ engineers to make surveys and estimates. It is a stupendous piece of work, but it is hoped to be completed, if the money is raised, in time for the World's Fair.

##### Water in the Milwaukee Tunnel.

On Oct. 22 there was a sudden rush of water into the new water-works tunnel being built under the lake at Milwaukee. The three steam pumps could not lower the level of the water, and the contractors have sent for larger pumps. The water came through the cement rock which overlies the tunnel and which is full of water-bearing fissures. At this writing it is unknown what the extent of the damage will be and how much work will be required to repair the break.

##### An Elevated Street.

One of the Chicago City aldermen has proposed a plan for connecting the three park systems of the city by an elevated roadway, beginning at the eastern terminus of Jackson Boulevard near Green street and running east to Michigan avenue. It is estimated that the entire roadway can be made for \$2,000,000, and the structure can be so designed as to be an ornament rather than an obstruction. The principal point to be gained is a permanent relief of the downtown streets from their present crowded condition. It might be supposed that the first objections to such a roadway would come from property owners along the proposed route, but this is not so for this particular plan, as it is not proposed to occupy any space over the sidewalks, and the second stories of the buildings can be readily connected with the roadway and increase the space for stores. It is further proposed that the roadway be covered with soft asphaltum to reduce the noise.

##### St. Clair Tunnel.

The stone work in connection with the tunnel approaches on both sides of the river was fully completed last week. The contractor for the work was Wm. Gibson, M. P., and the work has been going on for over a year. On the Canadian side the length of the retaining walls on each side of the track is 2,071 ft., and on the United States side 1,800 ft. These walls vary in thickness from 4 ft. to 5 ft. at the upper end of the approaches to 16 ft. at the portals on the north side of the approaches. In addition groins or counterforts were built every 16 ft., and intermediate cross walls were also constructed at the same distance to resist compression. Toward the portals the roadbed is almost one solid mass of stone-work. The work has been completed to the satisfaction of Mr. Hobson, to whom so much of the success of the tunnel is ascribed. The whole masonry work is one of the largest pieces of that kind of work done in Canada in several years, and forms a very material part of the tunnel work. Those in authority consider that the retaining walls built will resist any possible encroachments of the bank.

##### Electric Lighting in Chicago.

The town of Cicero, in Chicago, has secured contracts for electric lighting the streets at a price of \$14 per year for each 20-candle-power light, and \$18 per year for each 30-candle-power light. These prices are considered to be unusually low. The contractor has the option in a portion of the territory of changing the lights from gasoline to electricity. All other lights are to be electric.



**Engines in France.**

Recent statistics have shown that there are 7,000 locomotives in use in France. There are also 47,500 stationary engines and 1,856 marine engines under the French flag.

**The Polson Iron Works.**

The Polson Iron Works Co. is negotiating with the city of Toronto for land on the Esplanade adjoining the works for the purpose of establishing the steel shipbuilding works in Toronto. The company proposes to remove its extensive shipbuilding plant at Owen Sound to Toronto. The shipbuilding department will employ from 200 to 400 men and will be the scene of considerable activity in the coming season. A contract has been recently signed for the construction of a second cruiser for the dominion government, and several other vessels are under consideration.

**THE SCRAP HEAP.****Notes.**

The Michigan Central Railroad Company will also soon remove its general offices from the Adams building to the Monadnock and will occupy the fourth floor of that building.

The Wiggins Ferry Co. of St. Louis, which employs a hundred or more locomotive runners and firemen, has, after a conference with committees of the men, raised their wages and reduced their hours.

A despatch from Langtry, Texas, reports the capture of four of the Southern Pacific train robbers. One of the robbers, after a running fight for several miles, committed suicide in preference to surrender.

A Pittsburgh paper states that the freight trainmen of the Pittsburgh, Fort Wayne & Chicago who have to run through between Conway and Crestline have made an urgent request to have the former (shorter) runs restored.

On the night of Oct. 26 eight bridges, mostly trestles, were set afire on the Central of Georgia between Davisboro and Wadley. The telegraph wires were at the same time cut. The road was impassable only about 12 hours, however.

The Chicago & Alton has rented the ninth floor of the Monadnock building, corner of Jackson and Dearborn streets, Chicago, for general offices. The new quarters will be ready for occupation on May 1 next. The Monadnock building is a new structure with all modern improvements, and differs from other Chicago buildings in having light on all sides.

The fire in the foundry building of the Richmond Locomotive & Machine Works, Oct. 15, was extinguished before any great damage was done, and the department was in full operation the next Monday. The only damage done was to the roof of the foundry. All orders of the company are being filled promptly.

The Freight Claim Agents' Association of the West at a meeting in St. Louis has elected the following officers for the ensuing year: President, A. T. Drew; Vice-President, R. G. Richards; Arbitration Committee C. S. Tewksbury, W. H. Hancock and C. J. Sutton, the remaining members of the committee holding over. W. J. Evans was re-elected Secretary and Treasurer.

The trustees of Elizabethtown, Ky., have sued the Chesapeake, Ohio & Southern and the Newport News & Mississippi Valley companies for \$200,000 damages, caused by the removal of the company's shops from that town. The town in 1889 gave \$73,000 toward the construction of the road, upon condition that the shops should be permanently situated there. The shops were removed to Paducah about five years ago.

A mixture of oil and graphite is recommended on all screws in machinery to prevent them from becoming fixed and to protect them from rust. This mixture also facilitates tightening up. The Joseph Dixon Crucible Co., Jersey City, N. J., has for a number of years prepared graphite mixtures which have found favor with machinists and steam fitters. Dixon's graphite pipe joint mixture takes the place of red lead, and graphited oil is used where a thinner mixture is desired and also for lubricating bearings.

A cable dispatch of last week states that the grave increase in the number of railroad accidents in France lately has led to the discussion of that subject in the Cabinet and a circular has been sent to the railroad officials. Another item from France, apparently brought out by the same cause, states that a statistician has compiled the accident records for the 13 years 1875 to 1887 inclusive, from which it appears that during that time 2,350 million passengers were carried by the French railroads, at a cost of one killed for every 24 million and one injured for every 1.1 million. The English reports show that Great Britain carried in that time 8,130 million, exclusive of season ticket passengers, and that the number killed was one only in 40 million.

**World's Fair Notes.**

Work has been commenced on the Manufacturers' Building and will be continued night and day with three shifts of men working eight hours each. The electric light plant for furnishing light for this work has been completed. The Government Building has been commenced, and it is expected before cold weather that the building will be so enclosed that the interior work can be carried on during the winter.

The electricians of Germany have promised to make a larger electric display at the World's Fair than the one recently shown at Frankfurt.

Thomas A. Edison has applied for 35,000 square feet of the exhibit space in the Electricity Building.

Rules and regulations have been prepared for exhibits in the machinery department by L. W. Robinson, Chief of the department. The following is very incomplete which may be of interest to those who exhibit machinery:

A limited quantity of steam and water power will be furnished for the purpose of exhibiting machinery in operation, the quantity of each to be definitely settled at the time of allotment of space. Any excess will be charged for at a fixed price. Demands for such excess must also be settled at the time of allotment of space.

By special arrangements the installation of heavy articles requiring foundation should begin while the building is under construction. The floor of Machinery Hall will support 250 pounds per square foot. The heaviest single piece received must not weigh more than 30,000 pounds, as facilities will not be provided for handling heavier weights.

The steam pressure supplied will be 150 pounds to the square inch. Water pressure will be that due to a head

of 225 ft., or a pressure of 98 pounds to the square inch, and a head of 40 ft. or a pressure of 175 pounds to the square inch.

Driving pulleys are limited to 36 in. in diameter.

Exhibitors of steam and other machinery who desire to offer the exhibits for use by the exposition company should send their applications as soon as possible. Such exhibitors may select their own men to operate this machinery. Their wages will be fixed and paid by the exposition company.

The exposition company will defray the necessary expenses of exhibitors, loaning them machines, tools, etc., for use beyond that which they would have incurred as exhibitors simply, wear and tear excepted.

No fire will be allowed in Machinery Hall except by special permission. Not more than a day's supply of oils or other inflammable substances will be permitted in Machinery Hall, but a suitable place for the storage of these materials will be provided.

Exhibitors not desiring to employ attendants or watchmen may leave their exhibits in the care of the department, which will assume the responsibility of their cleanliness.

The total cost of the exposition structures is estimated by the Building Committee to be \$7,295,000. This does not include the cost of the foreign buildings. The World's Fair company has large expenditures to meet in addition to the cost of the buildings, estimated at \$10,530,053. This makes the total cost about \$17,800,000.

At a meeting of the committee appointed to prepare rules for the World's Fair passenger transportation committee, all existing passenger agreements were carefully considered, and it was finally agreed to adopt as far as possible the rules of the Chicago Railway Association, an organization composed of the Chicago terminal lines which attends to issuing the Chicago joint rate sheets, and other matters in which all the Chicago roads are interested. The next meeting is called for Nov. 6 at the Auditorium. Every line entering Chicago has joined that committee except the Lake Shore, which is holding back to see if the organization means business.

**New Stations and Shops.**

The Great Northern will soon commence work on a new passenger station at Sauk Centre, Minn. The structure will be one story in height and will be built of brick with sandstone trimmings and slate roof. It will be 26 x 104 ft. in dimensions. Other stations for the company under contract are those at Willmar and Anoka, Minn., and Grand Forks, N. D. The station at Grand Forks will be two stories in height, and will have a clock tower rising above the roof. The first story of this building will be faced with Kettle River sandstone and the second story and tower will be brick with sandstone trimmings. The station at Willmar is also a two-story structure, with offices for the division superintendent, roadmaster and other officers, in the second story. It is a 33 x 107 ft. building, and is built of brick; has sandstone trimmings and slate roof. The station at Anoka is 26 x 104 ft., one story high, and the materials used are the same as in the other stations.

**Central American Railroads.**

The Minister of Public Works of San Salvador has approved the surveys and profile plans submitted by Trigueros, Orellana & Son for a line of railroad between San Salvador and Santa Tekla, and the work of construction will be begun at once. Simultaneously a line will be built between La Libertad and Santa Tekla, making another route between the capital and the coast.

**Fifteen Passengers Killed in France.**

A passenger train running from Lyons to Grenoble was derailed near Moirans on Monday last and thrown down a 40-ft. embankment, injuring 50 people, a good many of whom, in addition to the 15 above noted, are likely to die.

**Government Aid to Railroads in Ontario.**

The last annual report of the Ontario Treasurer shows that during the year the Government of that province paid subsidies as follows to the railroad companies mentioned: Canada Southern, \$12,227; Toronto, Grey & Bruce, \$8,809; Midland, \$7,464; London, Huron & Bruce, \$13,441; Brantford, Norfolk & Port Burwell, \$6,467; Hamilton & North Western, \$36,484; Credit Valley, \$17,604; Grand Junction, \$7,535; Prince Edward County, \$7,776; Canada Atlantic, \$16,418; Victoria, \$25,163; Whitby, Port Perry & Lindsay, \$4,489; Prince Arthur's Landing & Kaministiquia, \$13,242; Kingston & Pembroke, \$19,671; North Simcoe, \$7,212; Grand Trunk, Georgian Bay & Lake Erie, \$11,453; Erie and Huron, \$6,110.

**Transportation at the World's Fair.**

At a conference held some time since between the World's Fair officers, the Illinois Central, Chicago City Railway, the Alley Elevated road, and the city authorities, a sub-committee was appointed to report on the transportation at the World's Fair. This committee is composed of John F. Wallace, Engineer of Construction of the Illinois Central, Chicago City Engineer Clark, and the Chief of Construction of the World's Fair. Directions were given them to map out the work and prepare the various problems for consideration which must be decided upon in order to provide proper transportation. At a meeting of this sub-committee held last week, it was decided to recommend at once that the Chicago City Railway Co. be granted better facilities for its down town terminal, and that the tracks of the Illinois Central between Fifty-first street and Sixty-seventh streets be elevated. The next problem to be considered is the matter of terminal facilities at the park. A large number of those interested believe that an elevated loop in the fair grounds is best, but the objection is raised that it will interfere with the landscape architect's plans, and in lieu of this a system of stub tracks has been proposed. It is stated that the sub-committee will not take the matter up for providing for roads that do not now have an entrance to the park, but will leave them to work out their own salvation. All that will probably be done will be to provide terminal facilities sufficient for all roads that will probably enter. However, the steamboat traffic between the lake front and Jackson Park will receive due consideration. It is intended to provide such superior facilities for landing at both ends as to offer inducements to vessel men to embark in the business of establishing lines of boats.

**Bridge Failure.**

On the night of Oct. 22 the second span of a new bridge in course of erection over the Potomac River at Hancock, Md., fell, killing two men, the bridge being 90 ft. above the water. It is said that the work of erection was in charge of the Groton Bridge Co., of Ohio.

**LOCOMOTIVE BUILDING.**

The Baldwin Works have received orders for 10 compound locomotives from the Mexican National Railroad, also 25 compounds from the Philadelphia & Reading. The experimental stock engine has been completed and will be given to the Master Mechanics' Association's committee to test as the members may decide. The 100 compounds, which were to be constructed in the near future, as stated by Mr. Vauclain at the recent Master Mechanics' Convention, are now finished.

**CAR BUILDING.**

The Chicago & Eastern Illinois is letting contracts for 1,500 freight cars.

The Chicago, Rock Island & Pacific is asking bids for building about 40 passenger cars.

The Chicago, Burlington & Quincy is again in the market for 30 passenger cars with the Hale & Kilburn seat specified.

The Cleveland, Cincinnati, Chicago & St. Louis is in the market for 2,000 freight cars and for a number of passenger cars.

The Laclede Car Co., of St. Louis, is building 375 cars for the cable road of the Third Avenue Street Railroad in New York city.

The Old Colony has let a contract for 30 passenger cars to the Bradley Car Works. They will be equipped with the Hale & Kilburn seat.

The Chicago, Milwaukee & St. Paul has let a contract for 40 passenger cars to the Barney & Smith Mfg. Co. These will be equipped with Hale & Kilburn seats.

The Chicago, St. Paul, Minneapolis & Omaha will shortly place an order for four baggage and combination cars. This order will include one baggage car, one combined baggage and passenger and two combined mail, baggage and passenger.

The New York Central road will let this week the contracts for building 50 passenger cars with 50 ft. bodies, and 10 cars with 60 ft. bodies. The cars are to have the Cowell platform and buffer, Hale & Kilburn seats, Krupp steel wheels, and Pintsch gas. Orders will also be given out this week for building 14 combination cars and 20 baggage cars.

The plan of reorganization agreed to by a majority of the bondholders and stockholders of the United States Rolling Stock Co., provides for the organization of a new company. About \$500,000 cash has been subscribed by the assenting shareholders for additional working capital. A meeting of the creditors will be held at the office of Seward, Guthrie & Morawetz, 29 Nassau Street, New York City, when it is expected to arrange for the speedy reorganization of the company, and conserving the interests of the creditors while not sacrificing the assets of the company.

**BRIDGE BUILDING.**

Albany, O.—The King Iron Bridge & Mfg. Co., of Cleveland, O., has the contract for a steel cantilever bridge across the Willmansette River, at Albany, Ore. This bridge will be some 2,000 ft. long and contain a clear channel span of 400 ft.

Cote, Que.—Tenders are invited by the town of Cote, St. Antoine, Que., for stone necessary for the construction of the Glen Bridge.

Hintonburg, Ont.—Tenders are invited for the construction of a bridge over the stream known as "Ready's Creek," Carleton County, Ont. A plan and specification of the work can be seen at the Town Hall at Hintonburg. The bridge and its approaches must be completed before July 15.

Memphis, Tenn.—The City Council of Memphis, Tenn., has finally provided for the construction of an iron bridge over Gayosso Bayou, at Mill street, to cost \$10,000.

Monongah.—A contract has been awarded to the Wrought Iron Bridge Co., of Canton, O., for the construction of an iron bridge 425 ft. long, across Coal Run, W. Va. The cost is to be \$12,750, and will be met jointly by the county court and the Monongah Coal & Coke Co.

Pleasant Hill, Md.—C. H. Smith, County Clerk at Pleasant Hill, Md., invites estimates on the cost of a bridge to be constructed over Brown's Run, near that place.

New York, Lake Erie & Western.—The company has let the following contracts this season:

To Union Bridge Co., Athens, Pa.: On Susquehanna division, a double track pin-connected bridge with four through spans; one 182 ft. 4 in.; two 148 ft. 8 in.; and one 152 ft. 8 in., the estimated weight of the bridge being 1,910,000 lbs.; on Delaware division bridge with four similar spans, 113 ft. 9 in.; estimated weight 1,380,000 lbs.; on Chicago & Erie; Spencerville, draw, one single track, plate girder span, 42 ft., weight 60,000 lbs.

To Elmira Bridge Co., Elmira, N. Y.: On Delaware division, one double track pin-connected deck span, 158 ft. 1 in., weight 420,000 lbs.; four double track plate girder deck spans, 45 ft. 3 in. and 25 ft. long, weight 160,000 lbs.; on western division, all single track plate girder deck spans, one 21 ft., weight 11,000 lbs.; one 34 ft., weight 20,000 lbs.; one 60 ft., weight 180,000 lbs.; and one 60 ft., weight 180,000 lbs.; on Rochester division, all similar spans; three 79 ft. each, weight 300,000 lbs.; one 64 ft., weight 91,000 lbs. On the Buffalo and southwestern division: One single track pin-connected through span, 133 ft. long, weight 183,000 lbs. For New York, Pennsylvania & Ohio: On eastern division, all single track plate girder deck spans, one 102 ft. 8 in., weight 185,000 lbs.; two 83 ft., weight 250,000 lbs.; two 98 ft. 6 in., weight 345,000 lbs.; and one 95 ft. 10 in., weight 165,000 lbs.

To Riverside Bridge Iron Works, Paterson, N. J.: One double track lattice girder through span, 100 ft. long, weight 210,000 lbs.; two double track plate girder deck spans, one 108 ft. long and one 32 ft. 9 in. long, weight 450,000 lbs.; on Buffalo division, two similar spans, one 65 ft. long and one 59 ft. 6 in. long, weight 227,000 lbs.; on Buffalo & Southwestern division three similar spans, but for single track; two, 34 ft. long, weight 39,000 lbs., and one 87 ft. long, weight 98,000 lbs.

The Union Bridge Co. was awarded the contract for the roof of a roundhouse at Galion, O., amounting to 215,000 lbs. of iron.



**Trenton Falls, Ont.**—The Grand Trunk has recently had surveys made for a new railroad bridge at Trenton Falls.

### MEETINGS AND ANNOUNCEMENTS.

#### Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:  
*Rome, Watertown & Ogdensburg*, 1½ per cent., payable Nov. 16.

#### Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

*Baltimore & Ohio*, annual, Baltimore, Md., Nov. 16.  
*Boston, Revere Beach & Lynn*, annual, Boston, Mass., Nov. 19.

*Boston, Winthrop & Shore*, annual, Boston, Mass., Nov. 19.

*Buffalo, Rochester & Pittsburgh*, annual, 36 Wall street, New York City, Nov. 16.

*Cleveland & Pittsburgh*, special, Cleveland, O., Nov. 18, to vote upon a proposed issue of bonds.

*East Tennessee, Virginia & Georgia*, annual, Knoxville, Tenn., Nov. 18.

*Kansas City & Memphis Railroad & Bridge Co.*, annual, West Memphis, Ark., Nov. 4.

*Manhattan (Elevated)*, annual, 71 Broadway, New York City, Nov. 11.

*Memphis & Charleston*, annual, Memphis, Tenn., and Huntsville, Ala., Nov. 30.

*New Orleans & Northeastern*, annual, New Orleans, La., Nov. 4.

*New York & Northern*, annual, 32 Nassau street, New York City, Nov. 11.

*New York, Lake Erie & Western*, annual, 21 Cortlandt street, New York City, Nov. 24.

*Utah Midland*, annual, Walker House, Salt Lake City, Utah, Nov. 2.

*Wisconsin Central Company*, annual, Milwaukee, Wis., Nov. 4.

#### Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* holds regular meetings at its rooms in the Gilsey House, New York City, at 2 p. m., on the third Thursday in each month.

The *Southern Railway Club* holds regular meetings on the third Thursday of the months of January, February, March, May, September and November at such points as are selected at each meeting.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. in the directors' room of the St. Paul Union Station.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesday in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturday of each month, excepting in January, when the annual meeting is held on the second Saturday of the month. The second January meeting is held on the third Saturday. The club stands adjourned during the months of July, August and September.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 38 Jacobson Block, Denver, on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Association of Civil Engineers of Dallas* meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month, at 7:30 p. m.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 p. m. on the first Friday of each month.

#### American Society of Mechanical Engineers.

The following list of topical questions has been prepared for the New York meeting, November, 1891:

89. Has any one ever tried to standardize sizes for keys? If so, what are his sizes?

90. Have you had any experience in outdoor work at night, in wind and storm, with portable apparatus for light in large quantities, other than electric light?

91. What is the best design for line shafting, transmitting over 50 H. P., permitting them to be stoppied and started on any floor, without interfering with the motor or other shafting?

92. What is the best method of correcting for the superheating of steam in figuring a boiler test?

93. In arranging chimney stacks for a battery of boilers is it best to use one for each pair, or a larger chimney for the entire battery?

94. Will there be any difference in the size of the chimneys required, when the boilers are the ordinary tubular type, or of some of the water-tube forms?

95. What is the best form of cylinder lubricator for engines carrying 140 lbs. of steam pressure, or over?

96. What are the maximum safe speeds for hoisting and traversing in an overhead traveling crane, in a machine shop?

97. Is there any advantage in using a circulating device for the water inside a boiler, particularly of the three-furnace Scotch form?

98. Is there any best way to group the tubes over the cylindrical furnaces of a Scotch boiler?

99. Will a forced circulation of air under a floor near the ground prevent decay of the woodwork and floor timbers?

100. Why should anyone cut a half-in. bolt with 12 threads to the inch? Is there any objection to the U. S. Standard of 13 threads?

101. Have you any facts to show that there is a molecular change in metals when their temperature is raised or lowered?

102. Have you any data as to earthwork dams which would suggest the factor of safety with which they have been built?

103. What have you found is the best form of straightening machine?

104. Have you had any experience with systems for purification of bad feed water before it gets into a steam boiler, either by precipitation or otherwise?

105. Is it better or not to have the lead increase with the load in high speed automatic engines, and, if so, why?

106. Are there not advantages to be claimed for a medium amount of back pressure and high compression lines in the same class of engines?

107. Has anyone tried sand-blasting as a method to produce a surface on cast iron before nickel-plating?

108. Is there any better method than jannapping to protect steel from corrosion?

109. What kind of wheel is best for grinding and bevelling glass plate? What is the best surface speed?

110. Which is the best process to repair old files, sand-blasting, etching or recutting? Do any of them really pay?

111. Is there any reason why diametral pitch should not be used for very large gears, instead of circular?

#### Southern Telegraphers' Association.

This is the name of an association recently formed at Jacksonville, Fla., by operators who formerly belonged to the Order of Railway Telegraphers, the revision of the rules of the latter so as to countenance strikes having caused these Southern men to withdraw. The new organization will be regularly incorporated under the laws of Florida. George W. Davis, Jr. is Chief Operator and C. H. Ground, of Jacksonville, is Secretary.

### PERSONAL.

—Mr. W. L. McGarr, roadmaster of the Beech Creek road, died last week at his home at Auburn, N. Y.

—Mr. H. B. Chamberlain has been appointed Acting General Manager of the Erie Dispatch, in place of Mr. George W. Ristine, who has resigned to go into other business.

Mr. Thaddeus M. Preval, for many years Master Car Builder of the Georgia railroad and for 42 years in the employ of the company, died at Augusta, Ga., Oct. 20. He retired from business life a few years ago.

—Col. John H. Lick, a director of the Delaware, Lackawanna & Western Railroad, Vice-President of the Valley National Bank, President of the Lickdale Iron Co. and of the Ellendale Forge Co., died at Lebanon, Pa., Oct. 22.

—Mr. Charles E. Bussell, formerly Chief Engineer of the St. Louis Railroad at St. Louis, Wis., has opened an office in the Phoenix Block, Duluth, Minn., and is prepared to make reports upon railroad work and mining and timber properties.

—Mr. Joel B. Harris died at his home in Rutland, Vt., last week. He was born at Sterling, Conn., in 1822 and entered the Rensselaer Polytechnic Institute at Troy in 1840. He was engaged as a civil engineer from 1842 to 1853, and as a railroad contractor from 1853 to 1880. He built large sections of the New York, New Haven & Springfield, the Boston & Albany, the Harlem and other roads. He lived for several years in Springfield, but went to Rutland in 1880, where he was engaged in the carwheel and general foundry business. In 1882 the business was reorganized as the Harris Mfg. Co., and has since been conducted with Mr. Harris as president. He was also president of the Springfield Foundry Co.

### ELECTIONS AND APPOINTMENTS.

*Arcadia, Gulf Coast & Lakeland*.—The following officers have been elected: President, Anthony Peters, 88 Lincoln street, Boston, Mass.; Vice-President, Edward Kakas, Boston; Secretary and Treasurer, Freder-

ick C. Peters, Arcadia, Fla.; Manager, Edward C. Ellis, Boston, and Chief-Engineer, John H. Powers, Arcadia. R. J. White, Mills Building, is General Agent in New York.

*Baltimore & Cumberland Valley*.—The stockholders at a recent meeting elected the following officers: J. M. Hood, Christian Devries, John W. Cable, C. W. Hamrichouse, Abram C. Frick, William S. Raynor and John K. Longwell.

*Bangor & Aroostook*.—The annual meeting of the stockholders was held at Bangor, Me., last week, and the following directors were chosen: A. A. Burleigh, C. F. Bragg, J. P. Bass, Edward Stetson, B. B. Thatcher, C. A. Gibson, E. L. Stewart. For Aroostook County: John A. Nadeau, Judah D. Teague, Willis I. Shaw. The directors elected A. A. Burleigh, President, and Charles F. Bragg, Vice-President.

*Brunswick, St. Marys & Florida*.—The road has completed its organization by electing W. J. Cahoon, of New York, President; J. A. Foster, Satilla Bluff, Ga., Vice-President; and J. J. Spear, of Brunswick, Ga., Secretary.

*Chicago, Rock Island & Pacific*.—I. L. Loomis, Passenger Agent at Philadelphia, has been appointed New England Passenger Agent, with headquarters at Boston, vice E. W. Thompson, resigned. James Gass has been appointed Traveling Passenger Agent at Buffalo, in place of W. J. Leahy, who succeeds Mr. Loomis.

*Cincinnati, Sandusky & Cleveland*.—All the old directors were re-elected at the annual meeting, with the exception of J. C. Davis, T. H. Lovett and A. S. Bushnell, who succeed Levi C. Wade, Isaac Fenno and N. W. Pearce.

*Cleveland, Cincinnati, Chicago & St. Louis*.—At the annual meeting held in Cincinnati, Oct. 28, the five members of the Board of Directors of fifteen whose terms expire were re-elected for three years. They are Cornelius Vanderbilt, William K. Vanderbilt, Chauncey M. Depew, J. Pierpont Morgan and M. E. Ingalls.

*Columbus, Springfield & Cincinnati*.—These directors have been re-elected: M. E. Ingalls, W. P. Anderson, George A. Farlow, Joseph Ramsey, Jr., E. F. Osborn, J. C. Davis and J. H. Thomas.

*Danville & Mount Morris*.—At a meeting of the directors of the company, held last week at 60 Broadway, New York, the following officers were elected: President, E. P. C. Lewis; Vice-President and Treasurer, August Stein; Secretary and Counsel, A. S. Murray, Jr.

*Fort Worth & Denver City*.—C. B. Smith has been appointed General Agent for the company at Dallas, Tex., vice H. M. De Hart, resigned.

*Georges Valley*.—The following officers and directors have been elected for the ensuing year: President, I. C. Thurston; Secretary, Benjamin Burton; Treasurer, O. A. Burkett; directors, Benjamin Burton, E. L. Thompson, J. M. Robbins, E. H. Burkett, A. F. Brown and Joel Hills.

*Great Northwest Central*.—H. F. Forrest, formerly of Winnipeg, has been appointed Chief Engineer of this company.

*Little Falls & Dolgeville*.—The following are now the directors and officers of this new road: A. Dolge, H. Faville, E. A. Brown, J. Brechwaldt, E. Dedicke and E. Polscher, Dolgeville, N. Y.; C. Amann and E. R. Wankell, New York City, and Titus Sheard, J. Gilbert, J. Barnett and W. Millegan, Little Falls, N. Y. President, Carl Amann; First Vice-President, Hon. Titus Sheard; Second Vice-President, Alfred Dolge, and Secretary and Treasurer, E. R. Wankell.

*Minneapolis & St. Louis*.—E. A. Whitaker has been appointed General Agent in charge of the freight and passenger business of this company at St. Paul, Minn., vice C. S. Tarbox, commercial agent, resigned to engage in other business. John E. Caine has been appointed contracting freight agent at St. Paul.

*New York, Lake Erie & Western*.—The following changes will soon be made in the Susquehanna Division: Ira Belknap, Trainmaster at Hornellsville, N. Y., will be made Superintendent of the Second Division of the New York, Pennsylvania & Ohio, and W. H. Barrett, Train Dispatcher at Elmira, will succeed him. Mr. Barrett will be succeeded by George A. Heller.

*Phillips & Rangleys*.—At a recent meeting of the stockholders Frank Jones, Arthur Sewall, Payson Tucker, J. S. Ricker and A. B. Gilman were elected directors in place of H. P. Closson, A. M. Spear, Weston Lewis, Luther Nile and Heber Bishop.

*Pueblo Union Depot Co.*—R. S. Seibert, Train Dispatcher of the Denver & Rio Grande Railroad, has been appointed Superintendent of this company, vice Mr. Reeve, resigned. It is understood that Mr. Reeve will accept the position of Superintendent of Terminals of the Chicago & Alton, at Chicago, which has been tendered him.

*St. Louis & San Francisco*.—At the annual meeting of the stockholders held at St. Louis, Oct. 27, the following board of directors was elected: John T. Davis, E. C. Simmons, Alvah H. Mansar, George C. Magoun, Thomas Baring, Cecil Baring, John J. McCook, William Libbey, George J. Gould, Alden Spear, Russell Sage, J. W. Reinhart and Allen Manvel.

*St. Louis Southwestern*.—J. W. Hogan has been appointed Treasurer of the St. Louis Southwestern of Texas and Tyler Southeastern roads, vice W. H. Evans, resigned to engage in other business. His headquarters will be at Tyler, Tex.

*Seaboard & Roanoke*.—O. V. Smith, of Norfolk, has been appointed Traffic Manager of the Seaboard system. J. W. Wilson succeeds Mr. Smith as General Claim Agent.

*Southern Central*.—The officers and directors of the company are: C. W. McKeehan, Philadelphia, President; W. Ross McPherson and Alexander Paterson, of Clearfield, Pa.; Joseph L. Tull, Philadelphia; Henry E. Davis and George H. Neff, Sunbury, Pa., and William C. McConnell, Shamokin, Pa.

*Texas, Sabine Valley & Northeastern*.—The following Board of Directors was elected at the annual meeting in Longview, Tex., Oct. 22: J. W. Yates, T. E. Clemmons, G. T. Merrill, J. M. Moberly, R. J. Evans, E. S. Larcher, F. M. Larcher, W. F. Herbert, Jr., and Austin Gallagher. Maj. R. J. Evans was elected in place of George Leigh-



ton, resigned. These officers were elected: President, E. S. Larcher; Vice-President and General Manager, R. J. Evans, and Secretary and Treasurer, W. F. Herbert, Jr.

**Toledo, St. Louis & Kansas City.**—The directors have organized by electing the following officers for the ensuing year: S. R. Callaway, President; Martin L. Crowell, Secretary; W. Howard Gilder, Treasurer.

#### RAILROAD CONSTRUCTION, Incorporations Surveys, Etc.

**Altoona & Wapsononock.**—The company is still pushing the work on the big fill and trestle which will do away with the "switch back." The grading of the three-mile branch to the Richlands, Pa., is also being pushed forward rapidly and is nearly completed. This extension will open up a large coal field.

**Americus & Tampa.**—Articles of incorporation have been recently filed by this company in Florida. The road is to extend from near the North state line of Florida between the Aucilla River and the Withlacoochee River, to Tampa Bay, 210 miles, through the counties of Jefferson, Madison, Taylor, Lafayette, Levy, Alachua, Citrus, Marion, Hernando, Pasco and Hillsborough. The capital stock is to be \$2,500,000. The incorporators are J. J. Willford, B. H. Hardaway and Joseph Tillman.

**Arcadia, Gulf Coast & Lakeland.**—The officers and directors in Boston have been conducting negotiations for some little time arranging for the construction of part of the line, and they expect to let the contracts shortly. The road which the company proposes to construct is practically two distinct lines converging near the northern terminus, Lakeland, Fla. Surveys have been made for both lines and practically all the right of way is already secured. One line is to extend from Lakeland south westerly to Snead Island, at Tampa Bay, 46 miles. The longer division begins at Keyville, on this line, a few miles from Lakeland, and extends southerly to the Gulf of Mexico at Boca Grande, at a point north of the terminus of the Florida Southern. The new route practically parallels that narrow gauge road, but at an irregular distance and to the west of it. The company has been guaranteed the right of way and a bonus by several phosphate companies for a branch of the line first described, to extend from Palmetto, near its western end, south, across the Manatee River to Sarasota, Fla., 17 miles. The route is level and through the phosphate region in western Florida. The principal traffic will be the transportation of phosphate from the mines to tide water. The land grant from the state of Florida, under the special charter of the company granted last spring, is 3,840 acres. The capital stock is \$1,500,000. The names of the officers are given in another column.

**Baltimore & Ohio.**—The company has awarded Col. P. H. Bennett the contract for grading below Fairmont, W. Va., for about five miles of new road to the bridge of the Fairmont, Morgantown & Pittsburgh road. The contractor began work this week.

**Brunswick, Western & Southern.**—The Wilmington & Southport charter has been purchased by this company, organized with Geo. L. Dunlap, of Chicago, as President, Frank Ullery, of Chicago, as Vice-President, Geo. H. Bliss, of Chicago, as Secretary, and H. H. Dougherty, of Newark, N. J., as General Manager. It is the plan of this company to complete a railroad from Wilmington, N. C., to Southport, N. C. It is also proposed to extend the road in a southerly direction.

**Burlington & Missouri River.**—Grading will be continued during the winter, it is stated, on the extension of this line beyond Gillette, Wyo. The seven miles of road beyond Gillette includes much heavy work, and Kilpatrick Bros. & Collins, who are building the line, will probably have a force working on this section for the greater part of the winter.

**Carrabelle, Tallahassee & Gulf.**—Capt. John W. Cook, Chief Engineer, began a locating survey last week between Tallahassee and Thomasville, Fla.

**Canadian Pacific.**—Vice-President Shaughnessy, of the Canadian Pacific, when asked the other day as to the intention of the company to replace the wooden bridges and trestles on the western division with metal structures, as has been stated, said: "We have had 10 steam shovels at work between Montreal and Fort William, Ont., during the last summer, filling in and surfacing the line. In two years more we will have all the wooden bridges east of Winnipeg eliminated. Of course in the mountain section, where it is impossible to fill in, all the wooden structures will be ultimately replaced by iron bridges, though the change will be gradual, as the present structures are perfectly good, and will be so during the natural life of the material."

The grading on the Deloraine extension is now about half finished and will be entirely completed this fall. Tracklaying will probably not be done until next spring. The extension is 18½ miles long and is being built from Deloraine northwest to Napinka, Man., on the Souris branch.

**Columbus & Westerville.**—The charter of this company, which has been organized at Columbus with a capital stock of \$100,000, was filed in Ohio this week. It is proposed to build a suburban line to Westerville.

**Concord & Montreal.**—The grading is now nearly finished on the extension of the Whitefield & Jefferson to Gorham and New Berlin, N. H. Cars will hardly be running on the line, which reaches the northeastern borders of the White Mountains, until well on in the summer.

**Coos Bay, Roseburg & Eastern.**—The track has been laid for several miles south of Marshfield, Ore., and rails for nearly 20 miles have been delivered at Coos Bay. Right of way complications have harassed the projectors and delayed the work, but these have been settled, especially that of the California Lumber Co., which owns important lands. The track is laid above Coos City and the road has been graded to Coquille City. The engineers are surveying beyond the latter town, up the middle fork of the Coquille River.

**Denver, Lakewood & Golden.**—The grading will be commenced in a few days on a branch of this road from near Golden, Colo., to Halston Creek. The line is only a short one and is being built by the Western Construction Co. The work will be completed in 60 days.

**Denver & Rio Grande.**—President Jeffery was petitioned last week by business men from the southern part of Colorado to reopen the line over the Veta pass to La Veta. Between Garland and La Veta the road has not been operated for some time because the company found

it did not pay. The road from Alamosa to Garland is a narrow gauge and is in operation, and the line westward from Cuchara to La Veta has been made standard gauge and is also in operation. The committee says that the route over Veta pass is 52 miles shorter to the San Luis valley than by way of Salida.

**Guntersville & Scottsboro.**—At a meeting of the Guntersville & Scottsboro Railroad stockholders a few days ago, the stock was all transferred to the Columbus City company, who have signed a contract to build this road from the Tennessee River at Guntersville northeast to Scottsboro, Ala., within six months.

**Hinton & New River.**—This company was incorporated in West Virginia last week to construct a railroad from the mouth of the Greenbrier River, near Hinton, up Greenbrier River to the mouth of East River, Mercer County. Of the capital stock \$1,200 has been subscribed. J. H. Miller, of Hinton, and others, are the incorporators. The road is intended to connect the Chesapeake & Ohio with the Norfolk & Western road.

**Hoosac Tunnel & Wilmington.**—The extension of this road from Readsboro north to Wilmington in southern Vermont will be formally opened for passenger traffic on Nov. 4. The extension is about 14 miles long.

**Jacksonville Southeastern.**—A dispatch from Galesburg, Ill., says: For several days engineers of the Jacksonville Southeastern have been surveying a line through Galesburg. It is said that the preliminary surveys are for a line from Havana, on the Atchison, Topeka & Santa Fe, to Rock Island.

**Kewaunee, Green Bay & Western.**—The last track on this line was laid near Kewaunee, Wis., Oct. 20, completing the line across the southern part of the Sturgeon peninsula, from Green Bay east to Lake Michigan. The line is 26 miles long.

**Lancaster, Oxford & Southern.**—The company is extending its track from Susquehanna Station to Peach Bottom Station, Pa., on the Columbia and Port Deposit Railroad at Peach Bottom.

**Mexican Central.**—Work on the Pachuca branch between Tula and Pachuca, Mex., is now being pushed vigorously, and it is now thought that the line will be finished by the end of January.

**Middletown & Odessa.**—The directors have negotiated a mortgage of \$50,000 with the Farmers Loan & Trust Co. of New York, and work on the new road between Middletown, Del., and Odessa will be commenced as soon as possible. The line will be about four miles long, but about three miles is located along a highway and the road commissioners threaten to stop the grading by injunction if any work is begun on line as at present located.

**Mississippi & Little Rock.**—Trains began running on this road, Oct. 23, from Aurich, Ark., the junction with the St. Louis Southwestern, west to Ross, a distance of 25 miles, as far as the track has been laid. The grading has been partly completed beyond Ross toward Little Rock.

**Newport & Sherman's Valley.**—The track on the extension of this road from Loysville, Pa., is now being laid and the work will probably be finished to Blair by Nov. 15. The extension is 10 miles long and extends in a westerly direction through Bixler's Run, Centre, Cissai Run and Andersonburg to Blair.

**New Roads.**—Work has begun on the new road between Bedford and Brook's Mill, Pa. When the line is completed it will join the Bedford division of the Pennsylvania road at Napier. The road is being built from a point north of Bedford, Pa., to Brook's Mill, following a survey made some years ago by the Pennsylvania, which is supposed to have an interest in the new road. The charter is for a line from Brook's Mill to Mann's Choice, but the southern part will not be built until next summer. C. F. Hobart, of New York, has the contract for building the line.

A press dispatch of Oct. 23, from Madison, Ind., is to the effect that important meetings of capitalists and business men were held in the city Oct. 22, in the interest of a projected railroad from Madison on the Ohio River, southeast to Lexington, Ky. The Indianapolis Board of Trade has taken hold of the enterprise. The projected road will be about 70 miles long.

**Norfolk & Western.**—President Kimball, who has just returned from Europe, says: "Work on all the extensions of the road will be pushed forward with greater vigor than ever. By Dec. 1 sixty miles of track on the Ohio extension will be completed to the bridge now being built across the Ohio River, and regular trains will be running to Columbus. The entire Ohio extension will be finished by next July, opening up the Pocahontas coke and coal regions to the west. The business of the road is growing so rapidly that it is difficult to provide cars fast enough. During the present season the Norfolk & Western has hauled from the Clinch Valley extension to tidewater a million bushels of wheat for export. This is an entirely new business, as the road did not handle a bushel of wheat for export last year."

**Northern Pacific.**—The contract for the change in the main line between Granite and Algoma, about 50 miles east of Spokane, Wash., was awarded last week to Thomas Olsen & Co., of Spokane. The distance between the two points is about 17 miles. The work is to be begun immediately.

**North Hudson County.**—The company has begun to drive piles for its projected elevated road from the Fourteenth street ferry, Hoboken, to the top of the bluff at West Hoboken, N. J. Trains are to be pulled up the steepest part of the incline by hydraulic power, which will also act as a brake upon trains going down grade. It is reported that the proposed transfer of the company's roads to a syndicate, of which the Hoboken Land and Improvement Co. and the Ballantine estate, of Newark, are interested, has been consummated for about \$2,000,000.

**Ohio Valley.**—A change of the location of the Nashville extension may soon be decided on. The right of way through Princeton, Ky., has not yet been secured, and there seems to be slight chance of securing the land without condemnation. It is proposed as an easier method to make a new survey for two or three miles, and build the road via Cadiz, Montgomery and Gracy to Hopkinsville.

**Paducah, Tennessee & Alabama.**—The extension from Paris on the Louisville & Nashville south to a connection with the Nashville, Chattanooga & St. Louis at Hollow Rock, Tenn., is now ready for the rails and the tracklaying will begin as soon as they are delivered. This work would have been commenced several weeks

ago but for the low water on the Tennessee River which prevented the delivery of the material. The incline at Paducah, Ky., for the connection with the Cairo Short Line, which reaches the opposite side of the Ohio River, is about completed.

**Pan American.**—The charter of the company has been filed in Austin, Tex. The line is to be 240 miles long, extending from Victoria to Brownsville, on the Rio Grande, through Victoria, Refugio, San Patricio, Nueces and Cameron counties. The proposed capital is \$3,000,000, and the directors are J. S. Anthony and others, of Boston, and J. B. Wells and others, of Texas.

**Pawnee.**—The company has decided to extend its line from the junction of the St. Louis & Chicago road, near Springfield, to Auburn, Ill., on the Chicago & Alton Railroad. President Henry Davis states that work on the extension will begin next week. It is the intention ultimately to extend the road to Roodhouse, thus connecting the two branches of the Alton.

**Philadelphia & Reading.**—The company has awarded to James J. Ryan & Co., of Philadelphia, the contract for the raising of the grade of Columbia avenue over the tracks of the railroad at Ninth street in Philadelphia. This important work at Columbia avenue is called for by the ordinance passed by Councils permitting the Reading Terminal to build to Twelfth and Market streets. The Reading Railroad is to pay the entire cost of changing the grade and the land damages. The cost of the former alone will be between \$125,000 and \$150,000. Beginning at Tenth street the grade of Columbia avenue will be raised on a stone abutment similar to the terminal structure. There will be an iron truss bridge over the tracks, and iron truss work will be used in the descent to grade east of the tracks.

**Pittsburgh & Lake Erie.**—The second track which is being built between Pittsburgh and Youngstown will not be completed this year as was anticipated. The double track extends from Pittsburgh to West Economy, 20 miles, and it will be extended to Phillipsburg, about eight miles farther, before work is suspended this year. At present workmen are engaged in the vicinity of Wampum. From Phillipsburg to Wampum the line is double-tracked, and also from Carbon to Youngstown, so that next season there will be but a comparatively small mileage to complete.

**Pittsburgh, Shenango & Lake Erie.**—Work is being pushed on the Conneaut extension from the main line south of Erie west to Conneaut Harbor, O. A small part of the track has been laid. All the right of way has not been secured, but the agents will soon effect settlements for all the property needed.

**Plymouth & Middleborough.**—At a recent special meeting, at Plymouth, Mass., it was voted that the town subscribe for \$10,000 of the stock of the company, in addition to the amount previously subscribed, making the town's interest \$50,000.

**Potomac Valley.**—The work on this branch is being rapidly pushed by the contractors, Ryan & McDonald. It is expected that the road will be in operation within 90 days, provided the weather does not interfere with the work of construction. The grading is nearly completed, the masonry work on the bridges is well advanced, and the iron for bridge construction is nearly ready for delivery.

**St. Louis & Hannibal.**—The contract for the extension through Ralls County will probably be let in a few days. The right of way has been secured and all arrangements are now ready to let the contract and begin the construction of the road. The extension is about 20 miles long and is to be built from New London southwest to Perry, Mo.

**San Antonio & Aransas Pass.**—The survey for the line to the Brazos River at its mouth was completed to Columbia, Tex., last week. The survey was commenced at Evergreens, and was run in a southwesterly direction through Fayetteville and Columbus and across the Colorado River near that point and thence along an old grade through Wharton to Columbia, a distance of 130 miles. The 40 miles between Wharton and Columbia is nearly level and the easiest grade on the route, and the abandoned grade is in good condition. From Columbia two routes have been surveyed to Brazoria and Velasco. From the latter point the line may be continued down the coast to San Louis Pass and to Galveston Island, J. A. Hinman, the engineer in charge, is connected with the San Antonio & Aransas Pass road, but, he says, the present survey is not being made by that company.

The contractors resumed tracklaying on the Waco section of the West Point division immediately after the settlement of the question of jurisdiction between the two county courts. There remained less than 10 miles of track to complete, and the last rails were laid Oct. 26.

**San Joaquin Valley.**—At a recent meeting of the stockholders in San Francisco the directors were authorized to issue bonds to the amount of \$2,000,000 for the portion of road completed and for the extension of the line. This is up to the limit of the capital stock authorized. President Pollasky announced that the entire indebtedness for work already completed had been paid and that the line had no indebtedness whatever.

**Sinnemahoning Valley.**—E. H. Goodyear, of Austin, Pa., is now at Galesburg, Pa., with a corps of surveyors, having made a survey from Austin to Galesburg for an extension of this road under the charter granted a few weeks ago, for the purpose of constructing a new railroad which is to be 40 miles in length and of the standard gauge. The new road will connect with the Addison & Pennsylvania road, which will also be changed to standard gauge.

**Southern Central.**—The local newspapers state that work will be commenced on this road near Sunbury, Pa., about Dec. 1. The surveys have been in progress for several months, and the engineers are now completing this work and revising the location. The line has been located from Sunbury, near the terminus of the Shamokin, Sunbury & Lewistown road, across the Susquehanna River and south paralleling the Northern Central on the opposite side of the river through Snyder, Perry and Dauphin counties to Harrisburg. The line will be 55 miles long, and pass through the towns of Selins Grove, Port Trevorton, McKees Half Falls, Liverpool, Buffalo, and other towns. From Dauphin to Rockville the Schuylkill & Susquehanna tracks will be used. From that point to Harrisburg four different routes are under consideration.

**South Florida.**—The Plant Investment Co. is building an extension of this road in Western Florida, from Pemberton's Ferry to High Springs, which will shorten the distance between Savannah and Tampa about 40



miles. The new road will be 93 miles in length, and will extend through a rich phosphate country, connecting with the Savannah, Florida & Western at Gainesville. Fourteen miles of the road have been completed, and a large force of hands is hard at grading and building the remainder of the road.

**Starke & Sampson City.**—C. L. Peek, General Manager, reports that this road, connecting Starke with Sampson City, Fla., will soon be graded and ready for the rails.

**Temiscouata.**—The St. Francis branch, which was built as far as Claire Station, N. B. (opposite Fort Kent, Me.), 20 miles from Edmundston, N. B., last year, has been extended to Connor's Station, 12 miles further up the St. John Valley this summer. Messrs. Malcolm & Ross, of Edmundston, were the contractors for the whole work and have just completed it in a satisfactory manner. The road has just been inspected by the Dominion Government Inspector and will be opened for traffic this week. The route is parallel to and in close proximity to the St. John River for the entire distance, and the terminus is now three miles below the mouth of its tributary, the St. Francis. Fifty-six lb. rails have been used. Maximum grades are 1.33 per cent. and curves 7 deg., but there are few of either. The work was moderately heavy, but no important structures were required; the largest is at Little River, where there is a trestle of 60 ft. The financial arrangements were all made before the work was commenced. The scenery along the line is very beautiful, especially in the fall, and the land is well adapted for agriculture, which is carried on extensively; about one hundred million feet of spruce, besides pine and cedar, is cut annually on the St. John and its tributaries along and above this branch line.

**Texas Trunk.**—G. W. Burkitt, the contractor, of Palestine, Tex., has received a reply from Receiver Dillingham, in which he states that owing to legal complications the proposition of Mr. Burkitt guaranteeing right of way and a subsidy an extension of the road to Palestine could not at present be accepted. The line will be extended beyond Kaufman as soon as possible.

**Tintic Ra ge.**—The contractors have completed the track as far as Goshen, Utah, the rails being laid into that town last week. The road was completed to Springfield some time ago and the track is now laid for about 20 miles from the connection with the main line of the Rio Grande Western near Spanish Forks. The grading has been finished and is ready for tracklaying from Goshen to the mouth of the Homansville canon. Trains will probably be running to that point in November. The contractors have a large force of men on the work near Homansville Pass and Pinion canon. All the heavy work will be completed to Eureka, the terminus of the line, before December. The line now under construction is 65 miles long.

**Velasco Terminal.**—Burket, Burns & Co. report the railroad grade rapidly nearing completion. Most of the crossings are on the wharves, and the first two cargoes of rails were delivered Oct. 25. The contractors claim they will require but 18 days to lay the ties and rails. The line will be in operation to Chenango, Tex., by Nov. 15. This will be the terminus if the Columbia branch of the International & Great Northern is improved and prepared for heavier traffic. Otherwise the new road will be extended to Arcola, Tex., on the Gulf, Colorado & Santa Fe.

**Wabash.**—The right of way is being purchased for the Detroit and Chicago line, which will leave the main line at Montpelier and extend to Hammond, Ind. The right of way agents have secured the right of way through La Grange and Noble counties. They now have to secure the right of way through Elkhart, St. Joseph, La Porte, Porter and Lake counties. President Ashley says that the company does not expect to get fairly to work on the new line to Hammond before spring. The right of way is now being purchased, and some work may be done on a few heavy cuts this winter, but no general effort at construction will be made before spring.

**Washington & Middletown.**—The company has been incorporated in Georgia, with a capital stock of \$500,000, to build a railroad from Washington to Middletown, a distance of about 30 miles. S. H. Martin, W. L. Mallon, J. W. McCalla and others are the incorporators.

**West Virginia Central & Pittsburgh.**—The extension of the road from Elkins to Beverly, W. Va., a distance of eight miles, is nearly completed, the track being laid to within a mile and a half of Beverly. The forces recently at work on the Beallington line have been transferred to the Beverly branch to complete it at once.

#### GENERAL RAILROAD NEWS.

**Allegheny Valley.**—The foreclosure sale under the decree of the United States Circuit Court at Pittsburgh, is to take place Dec. 15 next.

**Chicago & South Side Rapid Transit.**—The Elevated Railroad suit against the city is settled. The City Council have ordered the return of the company's \$100,000 guarantee deposit, the Circuit Court having previously decreed that the sum be paid to the company by the city.

**Cincinnati, Lebanon & Northern.**—At the annual meeting in Cincinnati last week the stockholders voted to issue \$500,000 five per cent. bonds, to be secured by mortgage of its property, \$200,000 to be used for retiring outstanding mortgage bonds, and balance to be used in widening the gauge and providing for additional terminals and extensions.

**Cleveland & Pittsburgh.**—The directors are understood to have decided to issue a general mortgage of \$10,000,000 for the various purposes of retiring outstanding issues and providing a new bond at a lower rate of interest, to be paid to the Pennsylvania Railroad Co. as lessee, in lieu of the seven per cent. construction and equipment bonds.

**Eel River.**—In the Circuit Court at Logansport, Ind., the appointment of Dennis Uhl as Receiver was confirmed. The appointment was made on application of D. D. Dykeman, a stockholder, who claimed the Wabash has leased the road and was appropriating the rolling stock, machinery, etc., to its own use.

**Grand Trunk.**—The half-yearly report of this company was issued last week. The directors admit the disappointing results of the half-year's operations, the net traffic receipts being \$471,775, as compared with \$549,469 for the preceding half-year, and the net revenue receipts being \$502,288, as compared with \$591,891 for the previous half-year. The decline the directors attribute to the low freight rates and low fares, and the deficient har-

vest of last year. This year's harvest, however, is so excellent in quality and quantity as to assure improved traffic until this time next year. The prospects of the company are more hopeful than for some time past. The condition of the road is such as to enable the company to receive better earnings than formerly from any increase in traffic. Two agreements for the lease of the Waterloo Junction Railroad will be submitted to the meeting.

**Intercolonial.**—Mr. Bowell, Acting Minister of Railways for Canada, states that the deficit in connection with the operation of this road for the year ending June 30, was \$684,948. Assuming that this covers the branches as well, the following table shows the net losses incurred by the Canadian Government in the working of the government roads during the last ten years: 1881, \$73,433; 1882, \$311,501; 1883, \$25,080; 1884, \$454,823; 1885, \$67,901; 1886, \$345,521; 1887, \$125,467; 1888, \$662,170; 1889, \$190,637; 1890, \$684,948; total, \$2,991,960. These roads have cost the country, on capital account, up to June 30, 1890, the sum of \$57,347,826.

**Iowa Central.**—The Supreme Court of Iowa has decided against the road in the suit of the state of Iowa for an order against the company to compel it to obey a decree of the Supreme Court entered against the road Aug. 27, 1887, ordering it to maintain and operate that part of its line between Northwood and Manly Junction in connection with the rest of the line to Albia. The road is now used and has been by the Burlington, Cedar Rapids & Northern at a rental of \$14,000 annually in connection with its line and not with the Iowa Central or the Central Iowa. The Court holds that the Iowa Central in failing to operate the line between Manly Junction and Northwood violates the decree of the Supreme Court, and an order as prayed for by the state on behalf of the Railroad Commission was granted.

**Laramie, North Park & Pacific.**—This branch of the Union Pacific, extending to the Soda lakes, 10 miles from Laramie, Wyo., has been abandoned and the material will be taken up. The operation of the line for its last fiscal year resulted in a deficit of nearly \$2,000 and the earnings of the branch have fallen short a few hundred dollars of even paying the taxes, which were last year over \$800.

**Lehigh Valley Terminal.**—The company executed a mortgage for \$10,000,000. This mortgage covers all the road from South Plainfield to Jersey City, and all terminal facilities, wharves and real estate in Jersey City. The proceeds of the bonds under this mortgage will pass to the Lehigh Valley Railroad Co. to reimburse them for expenditures in acquiring and improving the various properties covered by the mortgage. The mortgage is made in favor of the Farmer's Loan & Trust Co. of New York.

**Oregon Pacific.**—In the State Circuit Court, at Corvallis, Ore., the judge has fixed Dec. 9 as the date of the sale of the railroad.

**Pacific Short Line.**—This road was sold at foreclosure sale at Sioux City, Ia., Oct. 23, to George W. Wickersham and A. S. Garretson, as trustees, for \$2,000,000. They represent the holders of the \$2,583,000 bonds of the road, and the Manhattan Trust Co. of New York, E. P. Reynolds & Co., the contractors who graded the road, and who have a claim of \$60,000 for labor, and a few of the other claimants were represented. The claims against the road amount to about \$325,000. The road will probably be turned over to the purchasers about Nov. 1.

**Pennsylvania.**—The usual interview with President Roberts, after the annual inspection of the system by the directors, contains the following statements: We found the roadbed in very good condition. Our Western lines have reduced expenses pretty sharply, but that has not been at the expense of the road. The traffic has been lighter and expenses have been reduced some on that account, but it has not been necessary to spend as much money on improvements. When times are good we do a great deal of work, so that when occasion requires we can economize. On the Eastern lines we have spent quite as much as we did last year. We have bought between 80,000 and 85,000 tons of rails this year. The president of one of the large steel companies told me we would take one-tenth of the steel rail output of the country this year. In the agricultural districts we found everybody quite cheerful. People had more money and were spending it freely. The president of one of our lines, the Grand Rapids road, said to me that the people along his road had paid off \$1,000,000 in mortgages during the past year. In the manufacturing districts the effect of the crops has not been felt yet. The iron trade in Ohio is flat. I do not look for a revival just at present. The Pennsylvania system has not yet felt the effects of the large crops as the Western roads have. We depend upon manufacturing for our tonnage and not upon agriculture.

Following is the statement of the business of all lines of the company: Lines east of Pittsburgh and Erie, for September, 1891, as compared with the same month in 1890, show an increase in gross earnings of \$379,218; an increase in expenses of \$360,213; an increase in net earnings of \$19,005. The nine months of 1891, as compared with the same period of 1890, show an increase in gross earnings of \$482,954; a decrease in expenses of \$146,988; an increase in net earnings of \$629,942. All lines west of Pittsburgh and Erie for September, 1891, as compared with the same month in 1890, show a decrease in gross earnings of \$77,305; a decrease in expenses of \$18,471; an increase in net earnings of \$27,166. The nine months of 1891, as compared with the same period of 1890, show a decrease in gross earnings of \$1,294,121; a decrease in expenses of \$1,573,637; an increase in net earnings of \$279,516.

**Philadelphia & Seashore.**—This railroad, which is now being operated between Winslow Junction and Sea Isle City, N. J., a distance of 60 miles, will, it is said, pass into other hands in a short time. The road is at present in the control of a receiver, who is negotiating for its sale to a syndicate who will complete the road to Cape May.

**Southern Pacific Co.**—The company has just made up its reports for nine months of this year. The total earnings for the Pacific system for nine months are \$27,000,000, operating expenses nearly \$16,000,000, net earnings \$11,382,000. Deducting \$9,500,000 for fixed charges, there remains net earnings of \$1,907,928. With the earnings of the Atlantic system, and with the estimate of last year's business during the last three months of the year, the net earnings for the whole year will not fall short of \$4,000,000.

**Wheeling Bridge & Terminal.**—An agreement has been made that the Wheeling & Lake Erie will use the

bridge and tracks of this company for both freight and passenger service. It is only a question of time when that agreement will result in Wheeling & Lake Erie trains entering Wheeling.

**West Virginia & Pittsburgh.**—The engineers have finished the location of the road to Marlin's Bottom, in Pocahontas County, W. Va., and the route which runs up Williams river is said to be an excellent one without very heavy work with the exception of an 800 ft. tunnel.

#### TRAFFIC.

##### Chicago Traffic Matters.

CHICAGO, Oct. 28, 1891.

It is published here that the Chicago & Grand Trunk has notified shippers that it will absorb the switching charges on freight delivered to it from the various points in Chicago to go east. There is a regular charge for this service, many of the cars having to be taken several miles over the tracks of other companies to reach the terminals of the eastbound roads, and the Chicago & Grand Trunk claims to have found that its competitors are secretly absorbing the switching charges. It will be remembered that this company recently withdrew from the Chicago Eastbound Freight Committee, and it is now loudly claimed that the company will soon withdraw from the Central Traffic Association. The question of switching charges was discussed at a meeting of Eastern lines to-day, but no agreement was reached, and it is likely that the other roads will meet the rates of the Chicago & Grand Trunk.

The Western Freight Association lines are endeavoring to arrange with the trunk lines to waybill oranges and lemons at actual weights, same as is now done by Western lines, but the trunk lines so far decline to do it.

The chairman of the Western Freight Association has fixed upon Nov. 16 as the date for making effective the order of the Commissioners of the Western Traffic Association in respect to territory to and from which, on Missouri River traffic, St. Louis, Peoria and Chicago rates shall apply.

The Freight Committee of the Central Traffic Association has decided that it is not advisable to adopt a general rule to transport free shipments of stoves and stove castings to replace original consignments shipped at owner's risk and broken in transit, but that the matter be left to individual action.

##### Traffic Notes.

Lake rates have advanced to 2½ cents a bushel on wheat and 2¼ on corn, to Buffalo.

The British Government has contracted with the Canadian Pacific to transport 700 marines and sailors from Halifax to Vancouver and a like number from Vancouver to Halifax.

The reports published this morning that the Union Pacific, the Denver & Rio Grande and other roads have withdrawn from the Western Traffic Association do not seem to have any foundation.

The Texas Railroad Commissioners have modified the lumber tariff issued a few weeks ago, endeavoring to reconcile the conflicting interests of lumber manufacturers in different sections of the state.

The Texas roads are handling a large fast freight traffic, consisting of shipments which must reach Mexico before Nov. 1, when increased duties will be imposed by that government on imports of many kinds.

The Supreme Court of Oregon has decided in favor of the state Railroad Commissioners in the contest between that Board and the railroads concerning the power of the commissioners to reduce rates. It is held that the tariffs made by the commissioners last month are lawful.

The Interstate Commerce Commission has filed a complaint in the United States Circuit Court at Atlanta against the Cincinnati, New Orleans & Texas Pacific and other roads which have disregarded the order of the Commission reducing the rate on carriages from Cincinnati to Atlanta. The order was made some months ago on complaint of a shipper.

The strike of miners in the coke regions of western Pennsylvania has caused a marked diminution in freight traffic, a Pittsburgh reporter who has interviewed railroad officers estimating that there is a falling off in shipments of 1,200 carloads a day. A conference of the strikers and mine operators this week only resulted in a more decided disagreement.

Cotton is coming into New Orleans, Charleston and other Southern ports very rapidly. At Charleston last week there was a serious blockade, cars coming in much more rapidly than they could be disposed of. At New Orleans, on Tuesday of this week, the Louisville, New Orleans & Texas brought in 14,033 bales, being the largest day's receipts ever recorded in that city by any road.

The roads entering New Orleans have agreed with the merchants of that city to run "Merchants' Autumnal Excursions" from the surrounding country, the roads adjusting the dates so that the different excursions will not conflict with each other. Tickets will be about half price; in some cases less. They will be good going for one day and returning for about a week.

##### Eastbound Shipments.

The shipments of eastbound freight, not including live stock, from Chicago by all the lines for the week ending Oct. 24 amounted to 57,737 tons, against 57,331 tons during the preceding week, an increase of 406 tons, and against 68,037 tons during the corresponding week of 1890, a decrease of 10,300 tons. The proportions carried by each road were:

	Wk. to Oct. 24.		Wk. to Oct. 17.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	7,845	13.6	7,965	13.9
Wabash.....	4,116	7.1	4,088	7.1
Lake Shore & Michigan South.	8,168	14.1	8,536	14.9
Pitts., Ft. Wayne & Chicago..	8,848	15.3	7,063	12.3
Pitts., Cin., Chicago & St. L...	8,428	14.6	8,009	14.
Baltimore & Ohio.....	3,861	6.7	3,623	6.3
Chicago & Grand Trunk.....	3,896	6.8	4,970	8.7
New York, Chic. & St. Louis..	6,395	11.0	5,169	9.
Chicago & Erie.....	6,209	10.8	7,908	13.8
Total.....	57,737	100.0	57,331	100.0

Of the above shipments 2,934 tons were flour, 22,266 tons grain, 2,123 tons millstuff, 4,039 tons cured meats, 9,033 tons dressed beef, 2,111 tons hides and 4,427 tons lumber. The lake lines carried 65,243 tons, against 82,779 tons during the preceding week, a decrease of 17,536 tons.